End Semester Examination, May 2014
B. Tech. – First Semester
INDUSTRIAL CHEMISTRY (CH-101)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Briefly state the two broad approaches for the synthesis of nanomaterials.
    b) Write all units of hardness in water.
    c) Define desalination of water.
    d) What is microbial corrosion?
    e) What do you understand by phase rule? Explain with an equation.
    f) What is aniline point in lubricants?
    g) Briefly discuss the applications of biodegradable polymers.
    h) Define matrix phase in composites with an example.
    i) Write any four factors which affect corrosion.
    j) What do you understand by saponification number of lubricants? 2x10

**PART-A**

Q.2  a) Discuss the reverse osmosis method for desalination of the water with a diagram. 6
    b) What is soft water? Discuss Zeolite method in detail for softening of water. 6
    c) Standard hard water contain 1 gm of CaCO3 per litre. 50 ml of this standard water required 25 ml of EDTA solution. 50ml of this water sample required 18 ml of EDTA solution. Boiled water sample required 12 ml EDTA solution. Calculate all types of hardness in water. 8

Q.3  a) Discuss the mechanism of wet corrosion on the basis of evolution of hydrogen as well as absorption of oxygen. 8
    b) Explain the following:
       i) Differential aeration corrosion. ii) Galvanic corrosion 3x2
    c) How corrosion can be controlled by sacrificial anvelic protection? Explain with diagram. 6

Q.4  a) Explain the phase diagram of water in detail with a well labeled diagram. 8
    b) Write short notes on:
       i) Triple point
       ii) Pilling-Bedworth rule
       iii) Component with an example. 2x3
    c) Calculate number of phase, components and degree of freedom for the following:
       i) \(2\text{NO}_2(g) \rightarrow \text{N}_2\text{O}_4(g)\)
       ii) \(\text{CuSO}_4 \cdot 5\text{H}_2\text{O(s)} \rightarrow \text{CuSO}_4 \cdot 3\text{H}_2\text{O(s)} + 2\text{H}_2\text{O(l)}\) 3x2

**PART-B**

Q.5  a) What are composites? How they can be classified on the basis of matrix phase? Explain in detail. 6
    b) Write short notes on the following:
       i) Cloud and pour points
       ii) Viscosity and viscosity index 3x2
    c) Explain boundary and extreme pressure mechanism of lubricants. 8

P. T. O.
Q.6  a) What do you mean by fire retardant polymers? Write applications of fire retardant polymers.  
    b) Discuss following with applications:  
       i) Electrically conducting polymers  
       ii) Electroluminescent polymers  
    c) What are liquid crystal polymers? How they can be classified? Discuss the applications of liquid crystal polymers.  

Q.7  a) What do you mean by nanoparticles? How nanoparticles can be synthesized by sol-gel method?  
    b) What is the principle of scanning electron microscope (SEM)?  
    c) Discuss the following:  
       i) Application of nanoscience  
       ii) Advantage of AFM over SEM
End Semester Examination, May 2014
B. Tech. – First Semester
INDUSTRIAL CHEMISTRY (CH-101A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What are disinfectants? Name any two disinfectants used for treating water in order to make it potable.  
b) Write brief note on T.D.S?  
c) Why hardness is expressed in terms of CaCO₃ equivalents?  
d) Define alkalinity.  
e) What do you understand by dry corrosion?  
f) What is Pilling-Bedworth rule?  
g) Define flash point and fire point.  
h) Define reduced phase rule.  
i) What are the constituents of composites?  
j) Write any three applications of nanotechnology.  

2x10

PART-A

Q.2  
a) 50 ml of water sample requires 10 ml of 0.01 N EDTA when titrated using buffer solution (pH10) to attain the end point. Calculate total hardness of a sample in terms of PPM.  
b) Describe an ion exchange process. What are the advantage of this process?  
c) What do you meant by desalination of brackish water? Explain electrodialysis process.  

6

Q.3  
a) Write brief notes on: i) Stress corrosion ii) Galvanic corrosion  
b) Explain electrochemical theory of corrosion with suitable chemical reactions.  
c) i) Write any four factors affecting corrosion.  
ii) What is galvanisation and timing of corrosion?  

6

Q.4  
a) Explain eutectic system with a suitable phase diagram.  
b) Write brief notes on: i) Congruent M.P. ii) Desilvarization of Pb  
c) Draw and discuss of phase diagram of water system and write the applications of phase rule.  

6

PART-B

Q.5  
a) Write brief notes on: i) CMC ii) PMC iii) CCC  
b) What are important function of lubricants? Discuss the mechanism of extreme pressure lubrication.  
c) Write short notes on the following: i) Aniline point ii) Cloud point  

6

Q.6  
a) What are electrically conducting polymers? How are they classified?  
b) Discuss the uses and hazards of batteries.  
c) What do you meant by smart batteries? Write their applications.  

8

Q.7  
a) Explain electrodeposition technique.  
b) What do you mean by the term: nano? Discuss the significance of nano science and nanotechnology in engineering field.  
c) Discuss the different steps involved in sol-gel process for the synthesis of nanomaterial.  

6
End Semester Examination, May 2014
B. Tech. – First Semester
ELEMENTS OF COMPUTERS AND PROGRAMMING (CS-101)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt **FIVE** questions in all; Q.1 is compulsory. Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B**. Each question carries equal marks.

Q.1 a) Answer the following:
   i) \((2763)_{10} = (?)_2\)
   ii) \((101111.011)_{2} = (?)_{10}\)
   iii) Subtract 10011 from 101011.
   iv) Multiply \((100101)_{2}\) by \((1110)_{2}\)
   v) \((3645)_{10} = (?)_{2}\)

2x5

b) Write a note on computer memory hierarchy.
   5

c) Draw architecture of UNIX operating system.
   5

PART-A

Q.2 a) What is a computer system? What are the characteristic of a digital computer? 10
   b) Differentiate between primary and secondary memory. Write about concept of cache memory.
   10

Q.3 a) What is a programming language? Name the various categories of computer language.
   10
   b) Draw various flow chart symbols and explain use of each.
   10

Q.4 a) Write a program to read an array of 10 integers and print it in reverse order.
   10
   b) Write a program to find roots of a quadratic equation.
   10

PART-B

Q.5 a) Write a note on function parameter passing method.
   10
   b) What is recursive function? Write a recursive function to find \(x^y\).
   10

Q.6 a) What is string? How is it different from array?
   10
   b) Write a program to read data of 10 employee using structure tool, structure :
      ```
      struct:
      int emp_id;
      char emp_name[20];
      char contact_no[20];
      ```
   10

Q.7 a) What is FILE in C? Write a note on various file opening modes.
   10
   b) Write a program to read and display the content of a text file.
   10
End Semester Examination, May 2014
B. Tech. – First Semester
INTRODUCTION TO COMPUTER SYSTEMS (CS-102A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Write the techniques used in each generation of computers.
b) What do you mean by peripheral device? Give an example.
c) Fill in the blank: \((4052)_7 = (________)_10\).
d) Give examples of each type of software.
e) Write the difference between a compiler and an interpreter.
f) What are the differences between a hub and a switch?
g) Is C a high level or low level language?
h) Write the difference between multitasking and multiprogramming.
i) What is POST?
j) What do you mean by virus in a computer system? 

PART-A

Q.2 a) What are the characteristics of a computer?
b) Write a short note on evolution of computer.
c) Perform the following:
   i) \((4706)_8 = (________)_10\)
   ii) \((5AC)_{10} = (________)_2\)
   iii) \((68.53)_{10} = (________)_2\)
   iv) \((1011100)_{2} - (0111000)_{2} = (________)_{2}\)
   v) \((11111)_2 + (100111)_2 = (________)_{10}\)  

Q.3 a) Explain the functions of CPU.
b) What is primary memory? Differentiate it from secondary memory.
c) Explain the functions and architecture of HDD.

Q.4 a) Define the term: software. What are different types of software? Explain all with examples.
b) What are machine language and assembly language? What are their limitations?

PART-B

Q.5 a) Write short notes on:
   i) Translator
   ii) Assembler
b) What is an operating system? What is the need of an operating system? Explain its functions.

Q.6 a) What is a network? Explain the types of networks with examples.
b) What is Internet? What are its advantages and disadvantages? Explain its architecture.

Q.7 a) What do you mean by malicious software? Name and explain some of them.
b) Write short notes on:
   i) Antivirus
   ii) Password cracking
End Semester Examination, May 2014  
B. Tech. – First / Second Semester  
ELEMENTS OF BIOTECHNOLOGY (BT-101 / BT-101A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is metapopulation?  
b) Define speciation?  
c) Name different types of endoplasmic reticulum.  
d) Who proposed the concept of cell theory?  
e) Why are chromosomes called ‘hereditary vehicles’?  
f) What is Turner’s syndrome?  
g) Enumerate the difference between saturated and unsaturated fats.  
h) Mention the essential features of DNA replication.  
i) What is the importance of DNA vaccines?  
j) Enumerate any three objectives of bioethics.  

PART-A

Q.2  
a) Explain various stages of Meiosis I.  
b) Enumerate the various differences between Mitosis and Meiosis.  

Q.3  
a) How does adaptation help in the process of evolution of life forms?  
b) State the theory of Abiogenesis.  

Q.4  
a) Describe the mechanism of crossing over.  
b) Mention different mechanisms of chromosomal sex determination.  

PART-B

Q.5  
a) What do you mean by biomolecules?  
b) How are glycosidic bonds formed? Enumerate functions of carbohydrates.  
c) Explain different levels of protein structure.  

Q.6  
a) Discuss the advantages and disadvantages of transgenic plants.  
b) What are cloning vectors? Give examples.  

Q.7  
a) Enlist the entrepreneurship potentials of biotechnology.  
b) What is importance of biotechnology in human health?  
c) Give salient features of Cartagena protocol on biosafety.
End Semester Examination, May 2014
B. Tech. – First / Second Semester
PROGRAMMING IN 'C' (CS-103)

Time: 3 hrs

Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What do you understand by a preprocessor directive? Why are they required in a C program?
     b) What is the main difference between a variable and a constant?
     c) What is the importance of an array? Give examples.
     d) Explain the use and syntax of strcmp() function with examples.
     e) Give a general syntax of a structure within a structure datatype.
     f) Define pointer. How do you declare a pointer?
     g) What do you understand by a function prototype? Give example.
     h) Explain the tasks performed by fopen() function, when in 'r' mode.
     i) Discuss prefix and postfix increment operators with example.
     j) State the use of scanf() and printf(). Write a statement for each in C. 2x10

PART-A

Q.2 a) Explain primary datatypes used in C, along with example. 6
     b) What is an operator? Enlist all operators used in C. Explain the difference between '=' and '==' operator with example. 8
     c) Describe the if-else ladder with example. 6

Q.3 a) How are array elements stored in memory? Write a program in C to find the minimum and maximum element in an array of 20 elements. 10
     b) What do you understand by strings? Discuss strcpy() and strcat() functions and write a program in C for each function discussed? 10

Q.4 a) Explain the use of structures in C. How are structures declared and initialized? 6
     b) Write a program to implement how the values of a structure variable can be assigned to another structure variable of the same type using the assignment operator. 10
     c) Explain how are unions declared and initialized? How are they different from structures? 4

PART-B

Q.5 a) In pointers, explain the significance of '&', '*', '->' operators. Write a program in C to implement a pointer to an integer, a pointer to a float, a pointer to a char and print the values of the variables and their address using pointers. 10
     b) Write a program in C to implement pointer to an array. 10

Q.6 a) Discuss the use of a function in a C program. What do you understand by calling of a function? Describe the two ways of calling a function with the help of an example. 10
     b) Define recursion. Write a program in C to find the Fibonacci series, using recursion. 10

Q.7 a) Discuss the operations carried out on a file in detail. 10
     b) Write a program in C that copies the contents of one file to another file. 10
End Semester Examination, May 2014
B. Tech. – First / Second Semester
ELEMENTS OF ELECTRONICS ENGINEERING (EC-101)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is a semiconductor?
b) Define doping and why do we need it?
c) Draw the characteristics of an ideal diode.
d) What is a varactor?
e) Define peak inverse voltage.
f) Draw op-amp as current to voltage converter.
g) What are universal gates? Give examples.
h) What do you mean by data converters?
i) List the specification of A/D converters.
j) Give application of LCD displays. 2x10

PART-A

Q.2
a) What is an extrinsic semiconductor? Explain the process of formation of n-type and p-type semiconductors. 10
b) What is breakdown mechanism in diode? Explain different types of breakdown mechanism with the help of a neat diagram. 10

Q.3
a) Explain the working of centre-tapped full-wave rectifier with the help of a neat circuit diagram and list its various parameters. 10
b) Draw and explain clamping and clamping circuits. 10

Q.4
a) Explain the static characteristics of a transistor in common base configuration. 10
b) Explain the working of a transistor as an amplifier and oscillator. 10

PART-B

Q.5
a) What is an operational amplifier? List the characteristics of an ideal operational amplifier. 10
b) Explain the working of an op-amp as:
   i) Integrator.
   ii) Closed loop inverting amplifier. 10

Q.6
a) State De-Morgan’s theorem. Using De-Morgan’s theorem prove that:
   i) \( AB + CD = AB \cdot CD \).
   ii) \((A + B)(C + D) = (A + B) + (C + D)\). 10
b) What is a flip flop? Draw and explain the working of D-flip flop and T-flip flop. 10

Q.7
a) What is a microprocessor and a microcontroller? Differentiate between the two. 10
b) Explain the working of successive approximation A/D converter. 10
End Semester Examination, May 2014
B. Tech. – First / Second Semester
ELEMENTS OF ELECTRICAL ENGINEERING (EE-101 / EE-101A)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Superposition theorem is applied only to _______ circuits.
b) State Kirchhoff’s current law.
c) Define RMS value of a sinusoidal quantity.
d) What do you mean by resonance in an RLC series circuit?
e) What are the losses in a transformer?
f) kWh is the unit of _______.
g) PMMC meter can measure only _______.
h) Write down an expression for synchronous speed in terms of frequency and number of poles.
i) Single phase induction motor is not self starting. Is the statement true or false?
j) What is a commutator?  2x10

PART-A

Q.2  
a) Explain Maximum power transfer theorem.  
b) Obtain the current in the 1 Ω resistor in the following circuit using Thevenin’s theorem.

\[ \text{Diagram of the circuit} \]

Q.3  
a) An RLC series circuit with resistance 8 Ω, inductance 100 mH and capacitance 60 μF is connected across a voltage of 250 sine 314t volts. Find the impedance, current power factor, voltage across each element. Draw the phasor diagram of the circuit.  

b) Derive the relation between line voltage and phase voltage in a star-connected system.  

Q.4  
a) Explain construction of moving iron voltmeter.  
b) Explain induction type energy meter.  

PART-B

Q.5  
a) Compare shell type and core type transformer.  
b) Explain the working principle of a single-phase transformer.  

Q.6  
a) Draw and explain the parts of a DC machine.  
b) Derive the EMF equation of a DC machine.  

Q.7  
a) Explain the working principle of a 3-φ induction motor.  
b) Can an induction motor run at synchronous speed. Justify your answer.
Q.1 Rewrite the following sentences after correcting them for grammatical errors:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Mohan is tall than his sister.</td>
<td>b) This is the most unique device.</td>
</tr>
<tr>
<td>c) I prefer poetry than fiction.</td>
<td>d) Mr. Sahay is junior than me.</td>
</tr>
<tr>
<td>e) He is the oldest of three brothers.</td>
<td>f) None of the two brothers can swim.</td>
</tr>
<tr>
<td>g) Tina is very young to participate in the contest.</td>
<td>h) Jaya is very strong to lift the weight of 20 kilograms.</td>
</tr>
<tr>
<td>i) A gift-box that Riya gave me last week is stolen.</td>
<td>j) Ms. Deepali is a MA in English.</td>
</tr>
<tr>
<td>k) Beware with dishonest persons like you.</td>
<td>l) He was acquitted from the charge of murder.</td>
</tr>
<tr>
<td>m) I play cricket since childhood.</td>
<td>n) I will complete our work before you will return home.</td>
</tr>
<tr>
<td>o) The patient died before the doctor arrived.</td>
<td>p) Neither Natasha nor her sister are able to run fast.</td>
</tr>
<tr>
<td>q) Salim as well as his brother are very intelligent.</td>
<td>r) Much need to be done to eradicate poverty.</td>
</tr>
<tr>
<td>s) Each of the girls were in their best attires.</td>
<td>t) I am awaiting for his arrival.</td>
</tr>
</tbody>
</table>

Answers:

<p>| | |</p>
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</tr>
</tbody>
</table>
Q.2 Make two different sentences of the following Homonyms (Noun and Verb):

<table>
<thead>
<tr>
<th></th>
<th>Air</th>
<th></th>
<th>Laugh</th>
<th></th>
<th>Drink</th>
<th></th>
<th>Use</th>
<th></th>
<th>Demand</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Noun</td>
<td></td>
<td>Noun</td>
<td></td>
<td>Noun</td>
<td></td>
<td>Noun</td>
<td></td>
<td>Noun</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Verb</td>
<td></td>
<td>Verb</td>
<td></td>
<td>Verb</td>
<td></td>
<td>Verb</td>
<td></td>
<td>Verb</td>
<td></td>
</tr>
</tbody>
</table>

Q.3 Write your views on the topic "Advantages of Internet" in the space given below:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2x5
Q.4 Make sentences using the following phrases in such a way to bring out their meanings:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>A bed of roses</td>
</tr>
<tr>
<td>b)</td>
<td>A child's play</td>
</tr>
<tr>
<td>c)</td>
<td>A fool's paradise</td>
</tr>
<tr>
<td>d)</td>
<td>Above board</td>
</tr>
<tr>
<td>e)</td>
<td>By virtue of</td>
</tr>
<tr>
<td>f)</td>
<td>Fed up with</td>
</tr>
<tr>
<td>g)</td>
<td>Ill at ease</td>
</tr>
<tr>
<td>h)</td>
<td>Pass the buck</td>
</tr>
<tr>
<td>i)</td>
<td>Uphill task</td>
</tr>
<tr>
<td>j)</td>
<td>On the verge of</td>
</tr>
</tbody>
</table>

2x10

Q.5 Fill in the blanks by selecting appropriate words given in the brackets:

a) I applied the ________ (break/ brake) to stop the car.

b) She ____________ (adapted/ adopted) herself to the new environment.

c) Latika failed to get lower ____________ (berth/ birth) in the train.
d) ____________ (Check/ Cheque) your bank account.
e) This ____________ (device/ devise) is not working properly.
f) The deep scar on my heart fail to ____________ (heel/ heal)
g) She was the ____________ (lone/ loan) girl travelling with us.
h) The students have been waiting for the school ____________ (principle/ principal) since morning.
i) The deer fell ____________ (pray/ prey) to the hungry lion.
j) The last ____________ (rights/ rites) of the leader was done with full state honour.

Q.6 Give one word substitutes for the group of words given below:

| a) | A written declaration or oath |
| b) | One who does not believe in God |
| c) | A place that provides refuge |
| d) | A person who eats human flesh |
| e) | One who cannot hear |
| f) | A period of ten years |
| g) | The study of human mind |
| h) | A cure of all diseases |
| i) | An imaginary ideal |
| j) | When the name of the author is not known |

Q.7 Match the following words with their antonyms and write the answer in the given column:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Words</th>
<th>Antonyms</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Daring</td>
<td>host</td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>Diligent</td>
<td>timid</td>
<td></td>
</tr>
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<td>freedom</td>
<td></td>
</tr>
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<td>whisper</td>
<td></td>
</tr>
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<td>e)</td>
<td>Curse</td>
<td>forget</td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>Slavery</td>
<td>normal</td>
<td></td>
</tr>
<tr>
<td>g)</td>
<td>Queer</td>
<td>superficial</td>
<td></td>
</tr>
<tr>
<td>h)</td>
<td>remember</td>
<td>systematic</td>
<td></td>
</tr>
<tr>
<td>i)</td>
<td>Vital</td>
<td>blessing</td>
<td></td>
</tr>
<tr>
<td>j)</td>
<td>Yell</td>
<td>lazy</td>
<td></td>
</tr>
</tbody>
</table>
End Semester Examination, May 2014  
B. Tech. – First Semester  
COMMUNICATION SKILLS (HM-101A)

Time: 1 hrs  
Max Marks: 100  
No. of pages: 4

Note: Attempt ALL questions:

Q.1 Rewrite the following sentences after correcting them for grammatical errors:

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<td>This is the most unique device.</td>
</tr>
<tr>
<td>c)</td>
<td>I prefer poetry than fiction.</td>
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<tr>
<td>d)</td>
<td>Mr. Sahay is junior than me.</td>
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<td>e)</td>
<td>He is the oldest of three brothers.</td>
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<td>f)</td>
<td>None of the two brothers can swim.</td>
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<td>g)</td>
<td>Tina is very young to participate in the contest.</td>
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<tr>
<td>h)</td>
<td>Jaya is very strong to lift the weight of 20 kilograms.</td>
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<tr>
<td>i)</td>
<td>A gift-box that Riya gave me last week is stolen.</td>
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<tr>
<td>j)</td>
<td>Ms. Deepali is a MA in English.</td>
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<td>k)</td>
<td>Beware with dishonest persons like you.</td>
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<td>l)</td>
<td>He was acquitted from the charge of murder.</td>
</tr>
<tr>
<td>m)</td>
<td>I play cricket since childhood.</td>
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<tr>
<td>n)</td>
<td>I will complete our work before you will return home.</td>
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<tr>
<td>o)</td>
<td>The patient died before the doctor arrived.</td>
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<td>p)</td>
<td>Neither Natasha nor her sister are able to run fast.</td>
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<tr>
<td>q)</td>
<td>Salim as well as his brother are very intelligent.</td>
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<td>r)</td>
<td>Much need to be done to eradicate poverty.</td>
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<td>s)</td>
<td>Each of the girls were in their best attires.</td>
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<td>t)</td>
<td>I am awaiting for his arrival.</td>
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1x20

Answers:

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Q.2  Make two different sentences of the following Homonyms (Noun and Verb):

<table>
<thead>
<tr>
<th></th>
<th>Air</th>
<th>Noun</th>
<th>Verb</th>
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<tr>
<td>a</td>
<td></td>
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<td></td>
<td>Laugh</td>
<td>Noun</td>
<td>Verb</td>
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<td>b</td>
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<td></td>
<td>Drink</td>
<td>Noun</td>
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<td>c</td>
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<td>Use</td>
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<td>Demand</td>
<td>Noun</td>
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2x5

Q.3  Write your views on the topic "Advantages of Internet" in the space given below:
End Semester Examination, May 2014
B. Tech. – First Semester
PROFESSIONAL COMMUNICATION-I (HM-104)

Time: 3 hrs
Max Marks: 50
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Spot the error in the following sentences and rewrite them after correcting those errors. (Any Ten of the following):
   a) An uniform policy on national security is the need of the time.
   b) I played cricket when the ball hit me on the head.
   c) I know all the alphabets of my mother-tongue.
   d) If it rained, there will be no famine.
   e) None of the two sisters could pass the examination.
   f) Either he sent money or gift for her.
   g) What dress would you like out of these three ones?
   h) After the match will be over, let’s walk to the theatre.
   i) Five thousand rupees are not a big amount.
   j) The class mentor and chemistry teacher are coming.
   k) The weather of Shimla is more pleasant than Delhi.
   l) Little have been done to improve infrastructure.

   1x10

PART-A

Q.2 a) Bring out the difference of the meanings of the following words given in the pairs by using them in sentences. (Any Five):
   i) Advice – Advise
   ii) Eminent – Imminent
   iii) Dissent – Decent
   iv) Later – Latter
   v) Cite – Site
   vi) Adopt – Adapt

   b) Rewrite the following sentences replacing the underlined words with their appropriate synonyms. (Any Five):
   i) The message of the President was quite explicit.
   ii) I really relish listening to soft music in the evening.
   iii) You are testing my perseverance.
   iv) The flowers blossom in the morning only to fade away in the evening.
   v) Three workers were suffocated to death after the emission of toxic gases from the plant.
   vi) The chief witness was grilled for three hours by the investigation team.

   1x5

Q.3 Write a paragraph of approximately 200 words on the topic "Life without Internet". 10

Q.4 "Democracy is the best form of government." Write a debate in favour or against this statement. (200 Words) 10

PART-B

Q.5 Read the following passage carefully:

Social media what used to be considered a precious treasure is now the cause of teenage obesity, lack of concentration, inadequate communication, and above all a far less intellectual society. Cell phones, internet, video games, television all have taken over the youth in society and corrupted them into unimaginative, unqualified, dull robots. Facebook is merely a tool to drain the intelligence from teenagers until they

P. T. O.
are forced to speak in instant messaging jargon – LOL, OMG, TTYL. Twitter is a mechanism for teenagers to become hermits, living in their rooms updating their statuses every two minutes. Video games and television suck imagination from children’s minds, their eyes becoming plastered to a small pixel screen, their stationary bodies molded into the couch cushions. To stop a calamity like this from happening, there is only one option: abolish electronics and social media completely. If humanity can wipe away everything with batteries, plugs, and wires, people will become a more intellectual, responsive, exciting species on earth.

The banning of electronics and social media will create a safer society - less accidents and less health problems, 20/20 eye sight will quickly increase since children are not staring at screens for hours on end, and driving will become a leisure experience when drivers aren’t dodging busy people on cell phones swerving into the adjacent lanes. The obesity rate for children will be brought down to acceptable levels because there will be no more televisions to watch while a child stuffs his or her face with potato chips. People will be able to laugh out loud not LOL and ROFLing will be no more; if people want to roll on the floor and laugh, they can do so without being constrained to a tedious text message, IM, tweet, or wall post. Teenagers will have to look at a person when talking to them not text or chat, allowing society’s youth to become far better communicators. There will be no more sneaking into the girl’s bathroom to text your BFF about the cute boy that you &lt;3 so much, no more hiding cell phones beneath laps when your teacher thinks you are doing algebra homework. Students will not have to take out a calculator to know five times two equals ten or look on spark notes to understand that Romeo is a Montague and Juliet is a Capulet, all in all, a far more intellectual exuberant society.

Now answer the following question passed on the above passage:

a) What problems are caused by social media?  
b) How will society get benefited if we ban social media?  
c) How has social media affected our communication?  
d) Write the summary of the passage giving suitable title to it.

Q.6 Write a letter to the Director, Sport of your University requesting him to provide more sports facility within the campus.

Q.7 Write a conversation between two friends expressing their concern over rising incidents of rash driving on roads. (15 dialogues each).
End Semester Examination, May 2014
B. Tech. – First Semester
APPLIED MATHEMATICS-I (MA-101 / MA-101A)

Time: 3 hrs  Max Marks: 100
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Test for absolute or conditional convergence, the series
\[ 1 - \frac{1}{2^p} + \frac{1}{3^p} - \frac{1}{4^p} + \ldots \infty \quad (p > 0) \]
b) Give an example of monotonically increasing sequence which is i) convergent, ii) divergent.
c) Find the \( n^{th} \) derivative of \( \cos(ax + b) \).
d) If \( u = f\left(\frac{y}{x}\right) \), then find \( x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} \)
e) The value of \( \beta(2,1) + \beta(1,2) \) is ________.
f) If \( u = e^{\cos(x)} \cos(r \sin \theta) \); then find \( \frac{\partial u}{\partial r} \) and \( \frac{\partial u}{\partial \theta} \).
g) Find the general solution of \( \frac{d^2y}{dx^2} - 7 \frac{dy}{dx} - 6y = 0 \).
h) Solve the differential equation \( (D^2 + 4)y = \sin 3x \).
i) Find the unit normal to \( x^2 + y^2 + z^2 = 5 \) at \((0,1,2)\).
j) Give the physical interpretation of the gradient of a scalar point function \( f(x, y, z) \).

2x10

Q.2  a) Test the convergence of \( \sum_{n=1}^{\infty} \frac{1}{\sqrt{n + \sqrt{n + 1}}} \).

b) Prove that the series \( \frac{\sin x}{1^2} + \frac{\sin 2x}{2^2} + \frac{\sin 3x}{3^2} + \ldots \) converges absolutely.

c) Discuss the convergence of the series \( x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \frac{x^5}{5!} + \ldots \infty \).

Q.3  a) Expand \( (\sin^{-1} x)^2 \) by using Maclaurin’s series.

b) Expand \( \tan(x + \frac{\pi}{4}) \) in powers of \( x \) and evaluate \( \tan 46.5^\circ \).

Q.4  a) If \( x = r \cos \theta ; \quad y = r \sin \theta \); prove that
\[ \frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = \frac{1}{r} \left( \frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} \right) \]

i) \[ \frac{\partial^2 r}{\partial x^2} \frac{\partial r}{\partial y} = \left( \frac{\partial^2 r}{\partial x^2} \right)^2 \]

b) If \( u = \log \frac{x^4 + y^4}{x + y} \), show that \( \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 3 \).

c) If \( u = x + y + z, \quad uv = y + z, \quad uvw = z \); show that \( \frac{\partial (x, y, z)}{\partial (u, v, w)} = u^2v \).


P. T. O.
PART-B

Q.5  a) Evaluate \( \int_1^2 \int_1^2 \log z \, dx \, dy \).

b) Change the order of integration in the integral and evaluate \( \int_0^{\pi/2} \int_0^{\pi/2} \sin^{2m-1} \theta \cdot \cos^{2n-1} \theta \cdot d\theta \).

c) Prove that \( \beta(m,n) = 2 \int_0^{\pi/2} \sin^{2m-1} \theta \cdot \cos^{2n-1} \theta \cdot d\theta \).

Q.6  a) What is the directional derivative of \( f = xy^2 + yz^3 \) at the point \((2,1,-1)\) in the direction of normal to the surface \( x \cdot \log z - y^2 = -4 \) at \((-1, 2, 1)\).

b) Find the work done in moving a particle in the force field \( \vec{F} = 3x^2 \hat{i} + (2xz - y) \hat{j} + z \hat{k} \) along the straight line from \((0, 0, 0)\) to \((2, 1, 3)\).

c) Prove that \( \nabla \cdot \vec{r} = \vec{r} \cdot \nabla \vec{r} \) when \( r^2 = x^2 + y^2 + z^2 \) and \( \vec{R} = \hat{i} x + \hat{j} y + \hat{k} z \).

Q.7  a) Solve the differential equation \( (5x^4 + 3x^2y^2 - 2xy^3) \, dx + (2x^3y - 3x^2y^2 - 5y^4) \, dy = 0 \).

b) Using method of variation of parameters, solve \( \frac{d^2 y}{dx^2} + ay = \sec ax \).

c) Solve the simultaneous equations \( \frac{dx}{dt} - 7x + y = 0 \) and \( \frac{dx}{dt} - 2x - 5y = 0 \)
End Semester Examination, May 2014
B. Tech. – First Semester
APPLIED PHYSICS-I (PH-101)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) How does a photon differ from a material particle?
    b) Write Schrödinger’s time independent wave equation.
    c) Define reflectance and transmittance for a quantum particle.
    d) Discuss the phenomena of population inversion.
    e) Define acceptance angle and numerical aperture.
    f) What are equipotential surfaces?
    g) What are Bremsstrahlung radiations?
    h) What are secondary ionization and multiplication factors?
    i) Explain Chandrasekhar limit.
    j) Define parsec and astronomical units.  2x10

PART-A

Q.2 a) Derive Planck’s law of black body radiation.  12
    b) Explain group velocity and phase velocity. Derive an expression for group velocity with which a wave packet travels.  8

Q.3 a) Determine the normalized eigenfunctions and the energy eigenvalues for an electron confined to a one dimensional box.  15
    b) Discuss the phenomenon of tunneling in details.  5

Q.4 a) Describe the construction and working of a semiconductor laser.  10
    b) What is an optical fibre? Describe the multimode step index and multimode graded index optical fibres.  10

PART-B

Q.5 a) Derive expressions for divergence and curl of electrostatic fields.  10
    b) Derive an expression for work done in moving a charge in an electrostatic field.  10

Q.6 a) Explain different mechanisms of absorption of gamma radiations by matter.  10
    b) What is scintillation counter? Explain its principal, construction and working.  10

Q.7 a) Explain the effect of gravity on light. What is gravitational red shift?  10
    b) Write short notes on any two:
        i) Dark matter
        ii) Black hole
        iii) Big Bang  5x2
End Semester Examination, May 2014
B. Tech. – First Semester
APPLIED PHYSICS-I (PH-101A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is photo multiplier tube?
    b) What is electric susceptibility? Give its unit.
    c) What do you understand by a wave packet?
    d) Write an expression for Clausius-Mossotti relation and name the symbols used.
    e) What is relative permittivity? Give its unit.
    f) What are the differences between dielectrics and insulators?
    g) The length of a rocket ship is 50 meters on the ground. When it is in flight its length as observed on the ground is 49.5 meters, calculate its speed.
    h) State the postulates of special theory of relativity.
    i) What is the energy of a gamma ray photon having wavelength 1Å? Given $h = 6.62 \times 10^{-34}$ Js.
    j) What is laser pumping?

   PART-A

2x10

Q.2 a) What is an optical fibre? Explain the term acceptance angle and numerical aperture and deduce the expression for numerical aperture.
    b) Describe the construction and working of a semiconductor laser with necessary diagrams.

10

Q.3 a) What is Compton effect? Show that the change in wavelength of photon is given by
    \[ \frac{2h}{m_c} \sin^2 \varphi / 2, \]
    where symbols have their usual meanings.
    b) Derive time independent Schrödinger’s wave equation for matter waves.

12

8

Q.4 a) Distinguish between inertial and non-inertial frames of reference.
    b) Obtain Galilean transformation equations for space and time.
    c) Show that $m = m_0 (1 - v^2 / c^2)^{1/2}$ where $m_0$ is the rest mass of the body and $c$ is the speed of light.

10

PART-B

Q.5 a) Derive expressions for electric potential due to different distribution of charges.
    b) Obtain Cartesian solution of Laplace equation in one dimension for a parallel plate capacitor.
    c) Given a potential of the form $V = \frac{A}{r} + B$, where A and B are constants and r is a position vector. Check if the potential satisfies Laplace equation.

6

6

8

Q.6 a) Discuss electronic, ionic and orientational polarization of dielectrics.
    b) State and prove Gauss’s law in the presence of a dielectric.
    c) The distance between parallel plates of a capacitor, having dielectric of dielectric constant 2.5 is 5 mm. If the electric field strength inside the capacitor is $10^5$ V/m, determine the polarization vector, displacement vector and energy density in dielectric.

6

8

Q.7 a) What is the stopping power of a material? Explain different mechanisms which are responsible for the interaction of gamma rays with matter.
    b) Write short notes on any two of the following:
       i) Ionization chamber    ii) Proportional counter    iii) Scintillation counter

6x2
End Semester Examination, May 2014
B. Tech. – First / Second Semester
ELEMENTS OF ELECTRICAL ENGINEERING (EE-101 / EE-101A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Superposition theorem is applied only to ________ circuits.
b) State Kirchhoff's current law.
c) Define RMS value of a sinusoidal quantity.
d) What do you mean by resonance in an RLC series circuit?
e) What are the losses in a transformer?
f) kWh is the unit of ________.
g) PMMC meter can measure only ________.
h) Write down an expression for synchronous speed in terms of frequency and number of poles.
i) Single phase induction motor is not self starting. Is the statement true or false?
j) What is a commutator? 2x10

PART-A

Q.2
a) Explain Maximum power transfer theorem. 10
b) Obtain the current in the 1 Ω resistor in the following circuit using Thevenin's theorem.

[Diagram]

Q.3
a) An RLC series circuit with resistance 8 Ω, inductance 100 mH and capacitance 60 μF is connected across a voltage of 250 sine 314t volts. Find the impedance, current power factor, voltage across each element. Draw the phasor diagram of the circuit. 10
b) Derive the relation between line voltage and phase voltage in a star-connected system. 10

Q.4
a) Explain construction of moving iron voltmeter. 10
b) Explain induction type energy meter. 10

PART-B

Q.5
a) Compare shell type and core type transformer. 10
b) Explain the working principle of a single-phase transformer. 10

Q.6
a) Draw and explain the parts of a DC machine. 10
b) Derive the EMF equation of a DC machine. 10

Q.7
a) Explain the working principle of a 3-φ induction motor. 12
b) Can an induction motor run at synchronous speed. Justify your answer. 8
End Semester Examination, May 2014  
B. Tech. – First / Second Semester  
ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING  
(EE-102)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) State Thevenin's theorem.  
b) Explain principle of moving coil instruments.  
c) Define power factor.  
d) Explain operating principle of a DC motor.  
f) Write two applications of Zener diode.  
g) Convert the binary whole number 11001001 to hexa and binary.  
h) Why CE amplifier is the most widely used configuration.  
i) What is a flip-flop?  
j) Name two types of 3-phase induction motors.  

Q.2  
a) State and explain Norton's theorem.  
b) For the network in the figure determine the current in 30 ohms resistor using Thevenin's theorem.

\[ \text{Diagram: } \]

\[ 54 \text{ V} \]

\[ 18 \Omega \]

\[ 18 \Omega \]

\[ 30 \Omega \]

Q.3  
a) State and explain the conditions of resonance in a series circuit.  
b) A coil of resistance 20Ω and an inductance of 250 mH is connected in series with a capacitance of 40 μF across 200 V, 50 Hz supply. Calculate:  
i) Magnitude of current  
ii) Power factor  
iii) Voltage across each element  
v) Resonant frequency.

Q.4  
a) Explain the construction and working of a transformer.  
b) Derive the EMF equation of a DC generator.

Q.5  
a) Draw the circuit of a half-wave rectifier and explain its working with input and output wavefronts.  
b) What do you mean by positive and negative clamping. List two uses of clamping circuits.

Q.6  
a) Explain the working principle of an FET. Discuss advantages of FET over bipolar transistor.  
b) Draw the circuits of various transistor configurations. List their important features. Draw and discuss the input and output characteristics of a CE transistor.

Q.7  
a) What is Karnaugh map? Reduce the equation \( Y = A\overline{B} + AB \) using 2 variable k-map.  
b) Write a note on registers.
End Semester Examination, May 2014
B. Tech. – First / Second Semester
ELEMENTS OF MECHANICAL ENGINEERING (M-101)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is zeroth law of thermodynamics?
   b) Name two mountings used in a boiler.
   c) How will you classify steam turbines?
   d) Write the functions of a water pump.
   e) What is a dynamometer?
   f) Name different methods of power transmission.
   g) Define stress and strain.
   h) What is law of machines?
   i) Write composition of low carbon steel.
   j) What is difference between a pattern and a casting?

PART-A

Q.2 a) Discuss in detail, second law of thermodynamics with a neat sketch.
   b) Differentiate between water tube and fire tube boilers.
      12
      8

Q.3 a) What are different types of hydraulic turbines? Explain any one with suitable diagram.
   b) Explain Otto cycle on P-V and T-S diagram.
   c) Write the working principle of a Pelton turbine.
      10
      5
      5

Q.4 a) What is a gear train? What are various types of gear trains? Explain any one of them.
   b) How power is measured using a dynamometer? Describe.
      10
      10

PART-B

Q.5 a) Define and explain the following terms:
      Shear force, bending moment, shear force diagram and bending moment diagram.
      10

b) A rod 150 cm long and of diameter 2.0 cm is subjected to an axial pull of 20 kN. If
   the modulus of elasticity of the material of rod is 2×10⁵ N/mm², determine:
   i) Stress
   ii) Strain
   iii) elongation of rod
      10

Q.6 a) Differentiate between soldering and brazing.
   b) Write short notes on:
      i) Forging
      ii) Rolling
      iii) Extrusion
      8
      12

Q.7 a) What do you mean by resultant force system? Explain
   b) Define and classify vibrations. Is it possible to obtain natural vibration practically?
      If Yes/No why?
      8
      12
End Semester Examination, May 2014  
B. Tech. – First / Second Semester  
ELEMEN TS OF MECHANICAL ENGINEERING (M-101A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) State second law of thermodynamics.  
b) State polygon law of forces.  
c) What is saturated steam?  
d) Name the strokes in a four stoke diesel engine.  
e) Name two refrigerants.  
f) Name various types of gears used in power transmission.  
g) Define modulus of elasticity. What are its units?  
h) What is cast iron?  
i) State Lami’s theorem  
j) How is gas welding different from brazing?  

PART-A  

Q.2  
a) Describe the working of a two stroke petrol engine with the help of a suitable sketch.  
b) Differentiate between impulse and reaction turbines.  

Q.3  
a) Describe the formation of steam at high pressure from liquid water. Show the process on T-Q chart.  
b) Explain the working of a vapour compression refrigeration system.  

Q.4  
a) Describe various methods of mechanical power transmission.  
b) Derive the relationship between tensions on the two sides of a belt.  

PART-B  

Q.5  
a) Draw shear force and bending moment diagrams for the cantilever shown below:

\[ \text{Diagram of a cantilever with loads and distances} \]

b) Draw the stress-strain diagram for a ductile material. Label it appropriately.  

Q.6  
a) How is steel classified?  
b) Define and explain following engineering properties of materials:  
\text{i) Strength ii) Elasticity iii) Ductility iv) Brittleness v) Hardness}  

Q.7  
a) What do you understand by a free body diagram?  
b) Calculate tensions \( T_1 \) and \( T_2 \)  
\[ R = 20 \text{ kg} \]
End Semester Examination, May 2014
B. Tech. – First Semester / Second Semester
ELEMENTS OF MECHANICAL ENGINEERING (M-101B)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define heat capacity.
     b) What is polygon law of forces?
     c) Define internal energy of steam.
     d) Write in brief the working principle of reaction turbines.
     e) Name two refrigerants.
     f) Name any the various strokes of a four stroke petrol engine.
     g) Enumerate various methods of mechanical power transmission.
     h) Define modulus of elasticity.
     i) What is cast iron?
     j) Name various welding processes.

\[2\times10\]

**PART-A**

Q.2  a) Define work and energy.
     b) State Lami’s theorem. A weight of 2 kN is supported by two chains AC and BC as shown below. Determine tension in each chain.

\[\text{Diagram:}\]

\[10\]

Q.3  a) Show enthalpy changes during steam formation with a sketch.
     b) Describe various types of steam nozzles. Derive an expression for exit velocity of steam from a convergent divergent steam nozzle in terms of enthalpy drop.

\[10\]

Q.4  Discuss vapour compression cycle as used in refrigeration. Name at least two refrigerants.

\[20\]

**PART-B**

Q.5  a) What is a simple gear train? If the number of teeth of gears in a simple gear train are 100, 200, 300, 200 and 100, what will be the speed ratio?
     b) Derive an expression for the length of a flat belt for open belt system.

\[10\]

Q.6  a) A steel rod of 2 cm diameter and 10 m length is subjected to a tensile pull of 50 kN. Assume \(E = 2 \times 10^5 \text{N/mm}^2\), Determine:
     i) Stress
     ii) Strain
     iii) Elongation
     b) Draw the shear force and bending moment diagram for a cantilever beam of 6 m length subjected to a UDL of 2000 N/m across the entire length.

\[10\]

Q.7  a) What is meant by electric arc welding? Explain with the help of a diagram.
     b) What are the various mechanical properties of engineering materials? Describe in detail.
End Semester Examination, May 2014
B. Tech. – First / Second Semester
ELEMENTS OF MECHANICAL ENGINEERING (M-101C)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define heat capacity.
     b) State second law of thermodynamics.
     c) Sketch diesel cycle on P-V chart.
     d) Name at least three types of gears.
     e) Define modulus of elasticity.
     f) Mention units of shear force and bending moment.
     g) Name various types of welding processes.
     h) What is the range of carbon in cast Iron?
     i) Draw block diagram of a vapour compression type air conditioner.
     j) Mention and draw a sketch of each type of belt.  

**PART-A**

Q.2  a) State first law of thermodynamics. What are its limitations?  
     b) How is work defined in thermodynamics? What are the units of work, energy and heat?  
     
Q.3  a) Derive the relationship for length of belt in cross system.
     b) Calculate the length of a belt in a cross system if the two pulleys are 600 mm and 400 mm in diameter and 6 m apart.  

Q.4  a) Derive an expression for efficiency of a diesel cycle.
     b) Calculate the efficiency of a diesel cycle with compression ratio of 10. Fuel injection at constant pressure continues for 5% of the stroke.  

**PART-B**

Q.5  a) Draw stress-strain curve for a ductile material and label it appropriately.
     b) Calculate the reduction in height of a column 12 cm in diameter and 5 m long under a compressive load of 20 kN. Take \( E = 2 \times 10^5 \text{ N/mm}^2 \).  

Q.6  Draw the shear force and bending moment diagrams for a simple supported beam of 6 m span carrying a uniformly distributed load of 1000 N/m and a concentrated load of 2000 N at a distance of 2 m from one support.  

Q.7  a) How is steel classified?
     b) What is cast iron? Describe various types of cast iron along with their characteristics and applications.
End Semester Examination, May 2014
B. Tech. – First / Second Semester
ETHICS AND MORAL VALUES (HM-203)

Time: 1 hrs
Max Marks: 50
No. of pages: 5

Note: The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.

Q.1 Who was the first person to use the plural form of 'value' as values to denote moral beliefs and attitudes?
   a) Rousseau.       b) Friedrich Nietzsche.
   c) Karl Marks.     d) Sigmund Freud. 1

Q.2 Ethics refers to:
   a) Philosophical Science.
   b) The consideration of good and right for the society.
   c) Knowledge of basic principles of behavior.
   d) All of the above. 1

Q.3 The term value is derived from:
   a) Latin word Valerius.
   b) French word Valeur.
   c) English word Evaluate.
   d) None of the above. 1

Q.4 Which of the following is not a value under Positive personal values:
   a) Affection.
   b) Honesty.
   c) Anger.
   d) Loyalty. 1

Q.5 Being a student you have a preference value for:
   a) Studying hard.
   b) Earning money.
   c) Family tour.
   d) Social relationship. 1

Q.6 Universal Values mean:
   a) Same for everyone.
   b) Accepted by everybody.
   c) Both of the above.
   d) Neither of the above. 1

Q.7 Ethical behavior is characterized by:
   i) Arrogance.
   ii) Fairness.
   a) Only i) is correct.
   b) ii) and iii) are correct.
   c) ii), iii) and iv) are correct.
   d) ii) and iv) are correct. 1

Q.8 Values are conditioned by:
   a) Socio-cultural trends.
   b) Physical environment.
   c) Personal conscience.
   d) All of the above. 1

Q.9 Principles of values help an individual:
   a) To prefer one type of values over others.
   b) To value those who follow the values.
   c) To distinguish between moral and immoral.
   d) None of the above. 1
Q.10 The word ethos means:
   a) Morality.
   c) Character.
   b) Sensibility.
   d) Integrity.

Q.11 What among the following was not one of the objectives of ancient Indian education system?
   a) Life and existence of self.
   c) Mortification and Repression of self.
   b) Realization of self.
   d) Attainment of fearless bliss.

Q.12 What is not a feature of ancient educational system?
   a) Guru.
   c) Equal educational opportunity for all the Varnas:
   b) Guru- Shishya Relation.
   d) Physical education.

Q.13 What is not a feature of Gurukul system?
   a) Pursuit of knowledge and wisdom at the feet of the Guru.
   b) Duties of Shishyas.
   c) Government control.

Q.14 Ancient Indian education system was based on the philosophy that deals with.
   a) Realm of supernatural.
   c) Gods and Demons.
   b) Life itself.
   d) None of the above.

Q.15 The Ancient Guru:
   a) wielding strong influence in society.
   b) Always used to be lost in spiritual discourses.
   c) Charged the students heavily.
   d) Used to live in pomp and luxury.

Q.16 Ancient Indian education system was aimed at:
   a) Attainment of personal growth.
   c) Both of the above.
   b) Building responsible human beings.
   d) None of the above.

Q.17 Ethical behavior is applicable in:
   i) Professional field.
   iii) Work places.
   iv) Travel and similar temporary interactions.
   a) Only i) is correct.
   c) i), ii) and iii).
   b) i) and iii) are correct.
   d) All are correct.

Q.18 The Darshanas are based on:
   a) The Vedas.
   c) Both of the above.
   b) The Upanishads.
   d) None of the above.

Q.19 The Darshanas are believed to be written by:
   a) Ved Vyasa.
   c) Kalidas.
   b) Valmiki.
   d) Not by a single person.
Q.20 Lessons for Management can be drawn by the epics because:
   a) They tell much about the rulers and others characters managing situations and relationships.
   b) They contain Management rules.
   c) They tell about development of self.
   d) They focus on progress and growth.

Q.21 What was not a part of ancient texts?
   a) The Vedas.
   b) The Upanishads.
   c) The Ashtavakra Geeta.
   d) The Mahabharata.

Q.22 The word Veda originates from:
   a) The Sanskrit root Vad, meaning 'to speak'.
   b) The Sanskrit root Vid, meaning 'to know'.
   c) Both of the above.
   d) The Sanskrit root Vak, meaning 'goose'.

Q.23 Which one among the followings is not a Veda?
   a) Rigveda.
   b) Yajurveda.
   c) Samaveda.
   d) Arurved.

Q.24 The foundational scriptures of the Hindus are known as:
   a) The Vedas.
   b) The Jatakas.
   c) The Gita.
   d) The Aagams.

Q.25 The term Shruti is associated with:
   a) The Ramayana.
   b) The Mahabharata.
   c) The Vedas.
   d) The Gita.

Q.26 Business Ethics is also known as:
   a) Social Ethics.
   b) Corporate Ethics.
   c) Behavioral Ethics.
   d) Personal Ethics.

Q.27 Interest in business ethics accelerated dramatically:
   a) Towards the end of the 19th century.
   b) The beginning of the 20th century.
   c) The beginning of the 21st century.
   d) 1980s and 1990s.

Q.28 Business ethics:
   a) Can be both normative and descriptive.
   b) Is always a normative discipline.
   c) Can never be descriptive.
   d) Is exclusively a descriptive discipline.

Q.29 Business Ethics is a form of:
   a) Applied ethics.
   b) Philosophical discourse.
   c) Moral doctrine.
   d) Scientific theory.

Q.30 Which ancient Indian treatise gives a detailed account of the roles of rulers and various other types of social relations?
   a) Chanakya's Arthashastra.
   b) Panini's Ashtadhyayi.
   c) Kalidasa's Kumarsambhava.
   d) Patanjali's Bhashya.
Q.31 Quality of Work Life (QWL) can be defined as:
   a) The quality of relationship between employees and the total working environment.
   b) A process by which an organization responds to employee need for developing
      mechanism of their life at work.
   c) The degree to which a person enjoys the important possibilities of his/her life.
   d) All of the above.

Q.32 Quality of work life refers to Personal satisfaction:
   a) Experienced at work.
   b) At home.
   c) In the group of friends.
   d) At relatives place.

Q.33 TEAM stands for:
   a) Together everyone attends more.
   b) Together everyone attacks more.
   c) Together everyone achieves more.
   d) To become evil and moron.

Q.34 Importance of team work in the workplace is for:
   a) Fast learning
   b) Workload distribution
   c) Job satisfaction
   d) Increased speed of work

Q.35 Etiquette for team work are:
   a) Try to discourage others.
   b) Be tardy always.
   c) Be jealous of team mates.
   d) Show appreciation.

Q.36 Need for teams is to:
   a) Find alternate solutions to problems.
   b) Find answers for more complex problems.
   c) Have more no. of opportunities.
   d) All of the above.

Q.37 Contribute value to team meetings means:
   a) To show self appreciation.
   b) To contribute valuable points to meetings.
   c) To show I, Me and Mine attitude.
   d) To try to dominate the meeting.

Q.38 Ethical violations destroy:
   a) Nothing.
   b) Jobs.
   c) Trust.
   d) Profits.

Q.39 Warning signs of stress are:
   a) Lose confidence.
   b) Become irritable.
   c) Being less productive.
   d) All of the above.

Q.40 Common causes of excessive of workplace stress are:
   a) Fear of layoffs.
   b) Increased demand for overtime.
   c) Pressure to perform.
   d) All of the above.

Q.41 Few steps to reduce stress are:
   a) Taking responsibility for improving your physical and emotional well-being.
   b) Avoiding pitfalls.
   c) Learning better communication skills.
   d) All of the above.
Q.42 One can reduce job stress by:
   a) Taking care of oneself.  
   b) Get enough sleep.  
   c) Make food choices that keep you going and make you feel good.  
   d) All of the above.

Q.43 Qualities of a divine person are:
   i) Tolerant.  
   ii) Simplicity.  
   a) Only i) is correct.  
   b) i), ii) and iv) are correct.  
   c) i) and ii) are correct.  
   d) i) and iv) are correct.

Q.44 What is the meaning of Satyameva Jayate?
   a) Truth always wins.  
   b) Truth alone wins.  
   c) Truth ultimately wins.  
   d) Truth definitely wins.

Q.45 A good life is not defined as:
   a) A life of riches and prosperity.  
   b) A life of dignity and honour.  
   c) A life of health and longevity.  
   d) A life of utilization of all the opportunities.

Q.46 Which of the following statements about values is not correct?
   a) All values are equal in merit.  
   b) Values are the powerful force affecting human thoughts, feelings and actions.  
   c) Values contain a judgmental element i.e. a person's sense of right and wrong.  
   d) Values are relative in their worth.

Q.47 What among the following is not a prerequisite of good life?
   a) Easy satisfaction of basic needs  
   b) Potentials for satisfying health related and other social/ emotional needs.  
   c) Affluence and luxury.  
   d) Opportunity to assert one's worth and talent.

Q.48 Scientism does not refer to:
   a) Inadequacy of science while dealing with the realm of supernatural  
   b) Authority of natural science over all other interpretations of life.  
   c) The capacity of science in solving all human problems and all aspects of human endeavor.  
   d) The use of the style, assumptions and techniques, specifically displayed by scientists.

Q.49 The negative emotions like anger, ill-will, lust, jealousy and so on, may most appropriately be termed as:
   a) A-values.  
   b) Non-values.  
   c) Anti-values.  
   d) Negative-values.

Q.50 Which of the following are incidents of unethical business activity?
   a) Taking notebooks and pens home for personal use.  
   b) Using on the job time to write emails to your family and friends.  
   c) Using your cell phone to make a doctor's appointment during your lunch break.  
   d) Shopping for clothes online while at work.
End Semester Examination, May 2014
B. Tech. – Second Semester
ENVIRONMENTAL SCIENCE AND GREEN CHEMISTRY (CH-201)

Time: 1 hr. Max Marks: 50
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are emerging contaminants?
    b) Write any two effects of acid rain.
    c) Write any two examples of biological toxicants.
    d) _________ is the coldest layer of atmosphere.
    e) Write any two sources of lead.
    f) What is environmental impact factor?
    g) Name any two green reagents.
    h) What is the harmful effect of CO?
    i) Name two carcinogens.
    j) What is the effect of arsenic? 1x10

**PART-A**

Q.2 a) Write a short note on radiation balance of earth.
    b) Discuss the chemistry of upper atmosphere. 5x2

Q.3 a) Write the sources and effects of following:
    i) Nanoparticles
    ii) Bioaerosols
    b) Write the biochemical effects of:
    i) Cadmium
    ii) Mercury 2½x2

Q.4 a) Write the sources and effects of air pollutants.
    b) Write a short note on global warming. 5x2

**PART-B**

Q.5 a) Write any four principles of green chemistry with examples.
    b) How atom economy can be calculated? Give an example. 5x2

Q.6 a) What are green solvents? Write its two examples. 6
    b) Explain the synthesis of Ibuprofen with a comparison conventional method. 4

Q.7 a) Discuss the role of green analytical chemistry in sustainable development. 6
    b) What do you mean by green economy? 2
    c) Define biomimetics. 2
End Semester Examination, May 2014
B. Tech. – Second Semester
ENVIRONMENTAL SCIENCE AND GREEN CHEMISTRY (CH-201A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define primary and secondary pollutants.
   b) What are common sources of cadmium?
   c) What do you understand by direct and indirect solar radiation?
   d) What are volatile organic compounds?
   e) Write the full form of ATRP.
   f) Discuss the role of green chemistry in sustainable development.
   g) What are two types of Arsenic? Which is more harmful?
   h) Define phase transfer catalyst.
   i) How toxic effects can be classified?
   j) How can one prevent the water pollution?
   2x10

PART-A

Q.2  a) Draw and label the four layers of atmosphere with the pauses between them.
   Identify at least one interesting fact about each layer.
   10
   b) Discuss the chemistry of lower and upper atmosphere.
   5
   c) Write a note on ozone depletion.
   5

Q.3  a) Write a note on nanoparticle toxicity.
   5
   b) What are some major issues with respect to pharmaceuticals as emerging contaminants?
   5
   c) Name any four analytical techniques used for detection of contaminants in environment and discuss atomic absorption spectrometry.
   10

Q.4  a) How toxicity assessment can be done in real scenarios?
   10
   b) Write a note on air sampling.
   5
   c) What is the purpose of water sampling? What are the related issues?
   5

PART-B

Q.5  a) Explain first six principles of green chemistry with suitable examples.
   10
   b) What is the difference between green chemistry and environmental chemistry?
   5
   c) What do you understand by atom economy? How it can be calculated?
   5

Q.6  a) Explain ultrasound and microwave assisted green synthesis.
   10
   b) Explain the green synthesis of Ibuprofen and compare with conventional method.
   10

Q.7  a) Explain design strategy for separation and purification.
   b) What is the significance of green engineering?
   c) "Green Engineering can meet needs and minimize excess". Explain.
   d) How can complexity be conserved while products manufactured?
   5x4
End Semester Examination, May. 2014
B. Tech. – Second Semester
COMMUNICATION SKILLS (HM-101B)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Spot the error in the following sentences and rewrite them after correcting the error. Attempt any ten:
   a) An union of fishermen was formed.
   b) You came an hour late for the meeting.
   c) The roads of Delhi are wider than Feniabad.
   d) The fragrances of these flowers are very pleasing.
   e) The five brothers love each other.
   f) None of the two sisters can dance.
   g) The scissors that you gave me is blunt.
   h) I live in Delhi since 2005.
   i) With who do you live?
   j) This chair’s two legs are broken.
   k) I worked very hardly to complete the assignment on time.
   l) They them self are responsible for their plight.

   2x10

Q.2 a) Make sentences using the following foreign words to bring out their meaning:
   i) Sabotage.
   ii) Agenda.
   iii) Debut.
   iv) Eureka.
   v) Resume.
   vi) Alma mater.
   vii) Ad hoc.
   viii) Sine die.
   ix) Status quo.
   x) Versus.

   1x10

b) Fill in the blanks by using the appropriate phrasal verbs given in the brackets.
   i) Terrorists can _______ (blow up / boil down) even a shrine.
   ii) The turnover of the company has _______ (fallen down / fallen out) in recent years.
   iii) You never know when an epidemic will _______ (break up / break out).
   iv) Good mothers _______ (bring up / bring out) children with love and care.
   v) She _______ (broke down / broke out) after hearing about the sudden demise of her beloved friend.
   vi) The match was _______ (called at / called off) after the widespread disturbances at the venue.
   vii) You can always _______ (count on / countdown) me during a crisis.
   viii) It is very difficult to _______ (deal in / deal with) the rowdy crowd.

   ix) I am _______ (fed up / fall flat) with disobedient students.

   P. T. O.
x) Haryana Government has decided to ______ (take over / take for) sick power units of Sonepat.
xii) ______ (turn up/ turn on) for the meeting in five minutes!
   xii) I have seen the ______ (lay out / lay off) of the building.

Q.3 "Actors should not join politics." Write a debate in favour or against the topic. 20
Q.4 Write a paragraph on the topic "Corruption in India." 20

PART-B

Q.5 Express your views on any one topic:
a) The policy of Reservation in India
b) Capital Punishment 20

Q.6 Write an application to the Director of your college giving him explanation for your misconduct in the college and offer him an apology. 20

Q.7 Develop a discussion between two friends discussing the scope for employment for engineers in India. 20
End Semester Examination, May 2014
B. Tech. – Second Semester
PERSONALITY AND SOFT SKILLS DEVELOPMENT (HM–201A)

Time: 1 hr. Max Marks: 100
No. of pages: 5

Note: Attempt all questions:

Q.1 Scrambled Sentences. Rearrange and make meaningful sentences:
   a) too much / my teacher / homework / gives.
   b) they / last / married / summer.
   c) never / along / they / each / get / with / other.
   d) visited / the / he / museum / month / times / this / three.
   e) new books / my father / reading / enjoys.
   Answers:
   a) ___________________________________________
   b) ___________________________________________
   c) ___________________________________________
   d) ___________________________________________
   e) ___________________________________________

Q.2 Choose the most appropriate option from the options given below:
   a) Did you attend the lecture yesterday ________?
      i) No, I haven't.    ii) No, I hadn't.
      iii) No, I didn't.   iv) No, I don't.
   b) You haven't written the essay yet ________.
      i) Didn't you?  ii) Have you?
      iii) Haven't you? iv) Did you?
   c) That was an interesting book ________.
      i) Is it?      ii) Was it?
      iii) Wasn't it? iv) Isn't it?
   d) She wasn't very smart ________.
      i) Was she?  ii) Is she?
      iii) Isn't she? iv) Wasn't she?
   e) We sat under the shade of a tree and ate ________ lunch.
      i) My.  ii) Mine.
      iii) Him. iv) Our.

Q.3 Fill in the blanks with correct form of verbs given in the brackets:
   a) The students wanted ________ for an excursion. (to go/going)
   b) The journalist considered ________ the minister. (to approach/approaching)
   c) Please stop ________. You are disturbing the others in the library. (to whisper/whispering)
   d) The results were ________ (to encourage/encouraging)
   e) Sita wanted ________ driving. (to learn/learning)

2x5

2x5

2x5

1/5
Q.4  Write three rhyming words. The words sound the same as the one given:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Word</th>
<th>Rhyming word 1</th>
<th>Rhyming word 2</th>
<th>Rhyming word 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>sad</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>book</td>
<td></td>
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<td>3</td>
<td>Tax</td>
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<td>4</td>
<td>tough</td>
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<td>few</td>
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<td>Phone</td>
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<td>7</td>
<td>Team</td>
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<tr>
<td>8</td>
<td>great</td>
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<tr>
<td>9</td>
<td>Go</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>fast</td>
<td></td>
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</tr>
</tbody>
</table>

Q.5  Circle the words that do not sound like the others:
   a) Pin, win, slim, pull.
   b) Loan, moan, tool, groan.
   c) Leave, press, stress, dress.
   d) Clip, stood, slip, flit.
   e) Shook, crook, blood.
   f) Sit, as, fit, kit.
   g) Pool, whole, fool, food.
   h) Bed, dead, raid, red.
   i) Pin, win, pull, fin.
   j) Heart, mart, soon, part.

Q.6  Mark the functions in the following list:
You may find:
Introductions, Greetings, Giving or Asking Directions, Stating opinions, Agreeing or Disagreeing, Departing,

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Speech Functions</th>
<th>Name the function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>How do you do?</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nice to see you.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Good bye.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Please tell me the way to the nearest shopping mall.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>It seems to me that we need to review the document.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>See you later.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>I am of a different opinion because.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Hello. / Hi.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>I am of mixed opinions (about / on).</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>I simply must agree with that.</td>
<td></td>
</tr>
</tbody>
</table>
Q. 7 Write appropriate dialogue for the given situations:

a) When you introduce yourself to your Boss on first day in your office?

b) Greet a friend whom you are meeting after a long time.

c) How would you convey your Boss that you will be on leave the next day?

d) Request your friend to give you hundred rupees for an emergency.

e) Apologize to your friend for not being able to attend his birthday party.
Q.8  What do you mean by positive attitude? Give two examples.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

Q.9  Why are people afraid to set goals? Give two Reasons?

__________________________________________________________________________

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Q.10 Define the term TEAM. Why is team work important in profession?
End Semester Examination, May 2014
B. Tech. – Second Semester
ENVIRONMENTAL STUDIES (HM-202)

Time: 1 hr.  Max Marks: 50
No. of pages: 5

Note: The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.

Q.1 The pollutant responsible for ozone holes is:
   a) CO₂.  
   b) SO₂.
   c) CO.  
   d) CFC.  

Q.2 Which of the following is biodegradable?
   a) Iron nails.  
   b) Plastic mugs.
   c) Leather belts.  
   d) Silver foil.  

Q.3 In a lake polluted with pesticides, which one of the following will contain the maximum amount of pesticides?
   a) Small fish.  
   b) Microscopic animals.
   c) Big fish.  
   d) Water birds.  

Q.4 Which of the following is not a major greenhouse gas?
   a) Carbon Dioxide.  
   b) Methane.
   c) Water vapour.  
   d) Calcium Carbonate.  

Q.5 The 1987 Montreal Protocol was signed for which of the following reasons?
   a) To ban nuclear testing in tropical oceans.
   b) To phase out the use of CFCs, found to be causing depletion of the ozone layer.
   c) To stop the global trade in products made from endangered tigers.
   d) To begin converting from fossil fuel use to more renewable energy sources to reduce the anthropogenic greenhouse effect.  

Q.6 An example of a renewable resource is:
   a) Clay.  
   b) Sand.
   c) Water.  
   d) Fossil Fuel.  

Q.7 Compounds of ______ cause Minamata disease.
   a) Mercury.  
   b) Cadmium.
   c) Cobalt.  
   d) Fertilisers.  

Q.8 World Environment Day is celebrated every year on ________.
   a) 5th March.  
   b) 15th April.
   c) 15th May.  
   d) 5th June.  

Q.9 Ozone is present in:
   a) Troposphere.  
   b) Stratosphere.
   b) Ionosphere.  
   d) Mesosphere.  

1/5
Q.10 We and our surroundings together are called:
   a) Environment.           b) Atmosphere.
   c) Lithosphere.           d) Hydrosphere.

Q.11 Which of the following is responsible for acid rain?
   a) Hydrogen.              b) Oxygen.
   c) Sulphur dioxide.       d) Methane.

Q.12 What is the harm from the depletion of Earth's Ozone layer?
   a) The average temperature of earth's surface will increase gradually.
   b) The oxygen content of the atmosphere will decrease.
   c) Increased amount of Ultra violet radiation will reach earth's surface.
   d) Sea levels will rise as the polar ice caps will gradually melt.

Q.13 The concentration of which gas is highest in our environment?
   a) Oxygen.                b) Hydrogen.
   c) Nitrogen.              d) Carbon dioxide.

Q.14 What is carrying capacity (K)?
   a) The maximum population size that can be supported or sustained by a given environment.
   b) The minimum population size that can be supported or sustained by a given environment.
   c) The maximum people those can be sustained in a given environment.
   d) The minimum people those can be sustained in a given society.

Q.15 Biotic environment includes.
   a) Producers.             b) Consumers.
   c) Decomposers.           d) All the above.

Q.16 The groups of organisms which convert light into food are called:
   a) Autotrophs.            b) Heterotrophs.
   c) Decomposers.           d) Omnivores.

Q.17 The overall objective of resettlement and rehabilitation is:
   a) The affected labor force will be re-employed.
   b) The affected production base will be restored.
   c) Both.                  d) None.

Q.18 Air pollution is caused by:
   a) Insecticides.          b) Sewage.
   c) Smoke.                d) Loud speakers.

Q.19 Kyoto Protocol is for:
   a) Global warming protection.  b) Ozone layer depletion.
   c) Both.                  d) None.

Q.20 71% of earth surface is covered with:
   a) Land.                  b) Air.
   c) Water.                d) Coal.
Q.21 Sustainable development means that the:  
a) Pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but also for generations to come.  
b) No agreement at all.  
c) Pattern of resource use that aims to meet human needs.  
d) The human needs can be met only in the present, and not for generations to come.  

Q.22 Habitat diversity is:  
a) The range of habitats present in a region.  
b) A disturbance of the physical environment.  
c) Agreements under which property owners are allowed to harvest.  
d) None of the above.  

Q.23 Rotation of crops is essential for:  
a) Getting different kinds of crops.  
b) Increasing fertility of soil.  
c) Increasing quality of minerals.  
d) None of above.  

Q.24 Forest cover in India is:  
a) 637293 sq.km.  
b) 265321 sq.km.  
c) 856956 sq.km.  
d) 326589 sq.km.  

Q.25 Rivers can flood when:  
a) Dams fall.  
b) Landslides temporarily block a channel.  
c) Snow melts rapidly.  
d) All.  

Q.26 The term ecosystem was coined by:  
a) Haeckel.  
b) Charles.  
c) Edison.  
d) Ramanujan.  

Q.27 Energy level of a food chain is called:  
a) Trophic level.  
b) Tropic channel.  
c) Trophic phase.  
d) None.  

Q.28 Organization responsible for maintaining Red Data Book/Red List is:  
a) IUCN.  
b) CITES.  
c) WWEL.  
d) None.  

Q.29 Which of the following regions of our country are known for their rich biodiversity?  
a) Western Ghats and Eastern Himalayas.  
b) Western Ghats and Deccan plateau.  
c) Eastern Himalayas and Gangetic plain.  
d) None.  

Q.30 Which of the following animals is protected in Kaziranga Sanctuary of Assam?  
a) Indian bison.  
b) Indian lion.  
c) Indian rhinoceros.  
d) Indian elephant.  

3/5
Q.31 Maps depict the crown density of forests.
   a) Thematic.
   b) Areal.
   c) Schematic.
   d) None of above.

Q.32 In an energy pyramid, the bottom level represents:
   a) Consumers.
   b) Producers.
   c) Scavengers.
   d) Decomposers.

Q.33 Which of the following does not cause soil erosion?
   a) Wind.
   b) Overgrazing.
   c) Sun.
   d) Water.

Q.34 The gas associated with global warming is:
   a) CO₂.
   b) H₂S.
   c) CH₄.
   d) SO₂.

Q.35 Decomposers include:
   a) Bacteria.
   b) Fungi.
   c) Both.
   d) Animals.

Q.36 If waste materials contaminate the source of drinking water which of the following diseases will spread?
   a) Scurvy.
   b) Typhoid.
   c) Malaria.
   d) Anaemia.

Q.37 Chief source of energy in environment is:
   a) Fire.
   b) Moon.
   c) Sun.
   d) Stars.

Q.38 World’s current population is approx:
   a) 1 Billion
   b) 3 Billion
   c) 7 Million
   d) 7 Billion

Q.39 Population Explosion Means:
   a) Population explosion is the rapid increase of a population caused by such factors as a sudden decline in infant mortality or an increase in life expectancy.
   b) Population explosion is explosion of bomb in population.
   c) Population explosion is increase in population of one country.
   d) None of the Above.

Q.40 Climates are largely determined by:
   a) Location with respect to land and sea masses.
   b) Large scale patterns in the general circulation of the atmosphere.
   c) Latitude, altitude and local geographical features.
   d) All the above.

Q.41 Water Pollution Prevention Act was formulated in:
   a) 1980.
   b) 1983.
   c) 1920.
   d) 1974.
Q.42 Overgrazing is a problem because:
   a) It takes weeds and plants from the ground which holds the water and soil in place.
   b) It causes earthquake.
   c) It causes Tsunami.
   d) All of the above.

Q.43 Example of mineral resources are:
   a) Wood, water and soil.
   b) Silver, gold and iron.
   c) Chemicals, fertilizers.
   d) All of the above.

Q.44 Energy and manure together are supplied by:
   a) Dung.
   b) Soil.
   c) Fuel.
   d) Coal.

Q.45 Intensive irrigation without drainage causes:
   a) Soil erosion.
   b) Deforestation.
   c) Water logging.
   d) None of the above.

Q.46 Animals that feed on both plants and animals are called:
   a) Herbivore.
   b) Carnivore.
   c) Omnivore.
   d) Consumer.

Q.47 Major water pollution is caused by:
   a) Industrial effluents.
   b) Waste gases.
   c) Microorganisms.
   d) Soil.

Q.48 Birth Rate is calculated as:
   a) Birth Rate. = \((\text{number of births}) / (\text{total population})\) \times 1,000.
   b) Birth Rate = \((\text{number of births}) / (\text{total population})\) \times 1,000.
   c) Birth Rate = \((\text{number of Deaths}) / (\text{total population})\) \times 1,000.
   d) None.

Q.49 Earth hour is celebrated to:
   a) Save water.
   b) Save earth.
   c) Save electricity.
   d) Save energy.

Q.50 Endangered species means:
   a) A species whose numbers are so small that the species is at risk of extinction.
   b) A species who has extinct from the Earth.
   c) A species which is less in no at some place.
   d) None
End Semester Examination, May 2014
B. Tech. – Second Semester
PROFESSIONAL COMMUNICATION-II (HM-204)

Time: 2 hrs
Max Marks: 50
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Attempt any five briefly:
   a) Describe briefly the role of emotions in communication.
   b) Explain horizontal communication.
   c) Explain the steps involved in conducting a meeting.
   d) What is encoding in the communication process?
   e) What is audience analysis?
   f) What are negotiation skills?

PART-A

Q.2 a) Fill in the blanks with appropriate options of foreign expressions:
   i) In order to complete the work early, the company hired casual workers on ____________ (ad hoc/ad interim) basis.
   ii) Oxford University is the ____________ (al beit/alma mater) of many a renowned personality.
   iii) Russia has always been a ____________ (bon ami/bon jour) of India.
   iv) With a weak king on the throne, the minister became the ____________ (cadre/de facto) ruler.
   v) Following the disturbance, the Lok Sabha was adjourned ____________ (status quo/sine die).

b) Make sentences with the given idioms and phrases to bring out their meaning.
   Attempt any five:
   i) Bed of roses
   ii) A child’s play
   iii) A red letter day
   iv) At home
   v) In a fix
   vi) Apple of one’s eye

Q.3 What is communication? Explain the different directions of professional communication.

Q.4 What do you understand by the terms: verbal and non-verbal communication? Explain the difference between verbal and non-verbal communication.

PART-B

Q.5 Express your views on the topic – “Your expectations from the next Prime Minister”.

Q.6 Prepare a Notice and Agenda for the fourth meeting of the Board of Directors. Assume the details.

Q.7 You recently purchased a mobile phone from Super Telecom Pvt. Ltd. The mobile is not working efficiently. Write a complaint letter requesting for replacement of the mobile phone.
End Semester Examination, May 2014
B. Tech. – Second Semester
APPLIED PHYSICS-II (PH-201)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
   a) Define crystalline and amorphous materials.
   b) Draw sketches illustrating (111) and (200) planes in a cubic unit cell.
   c) Is orientation polarization possible in non-polar dielectrics? Explain briefly.
   d) What is Bohr magneton?
   e) Explain the term: spontaneous magnetization.
   f) What is the formula relating dependence of critical magnetic field on temperature?
   g) Name types of superconductors.
   h) Discuss two important properties of semiconductors.
   i) Define the term: epitaxy.
   j) What do you mean by nanoparticles? 2x10

PART-A

Q.2  
   a) Derive an expression for inter planer spacing between two parallel planes in a simple cubic crystal. 6
   b) What do you understand by Schottky defects? Derive an expression for concentration of Schottky defects. 12
   c) A bcc crystal has \( d_{110} = 1.181 \) \( A \). X-rays of wavelength 1.54 \( A \) are diffracted by these planes. How many orders of Bragg reflections are observed in this case? 2

Q.3  
   a) Define the three electric vectors \( E \), \( P \) and \( D \) and determine the relationship between them. 12
   b) Derive an expression for the Gauss's law in presence of a dielectric medium. 8

Q.4  
   a) Derive an expression for diamagnetic susceptibility on the basis of Langevin's theory of diamagnetism and show that diamagnetic susceptibility is independent of temperature. 16
   b) Distinguish between diamagnetism, paramagnetism and ferromagnetism. 4

PART-B

Q.5  
   a) What is superconductivity? Explain Meissner effect in superconductors. 7
   b) Write a short note on BCS theory of super conductivity. 7
   c) What are high temperature superconductors? Give some applications of superconducting materials. 6

Q.6  
   a) Give the difference between direct and indirect band gap semiconductors. 5
   b) Explain the Bridgman method of crystal growth. 7
   c) Describe construction and working of a photovoltaic cell. 8

Q.7  
   a) Enumerate some physical properties of nonomaterials and give their applications. 10
   b) Describe any two methods for fabrication of carbon nanotubes. 10
End Semester Examination, May 2014
B. Tech. – Second Semester
APPLIED PHYSICS-II (PH-201A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Draw sketches illustrating (111) and (020) planes.
    b) What are the Schottky defects?
    c) Discuss two important properties of semiconductors.
    d) What do you understand by bulk crystal growth?
    e) What are traps?
    f) What is meant by magnetic flux density? Also give its units.
    g) What is Bohr magneton?
    h) What are superconductors?
    i) What do you mean by nanoparticles?
    j) Nanomaterials have larger surface area to volume ratio. Explain.

2x10

PART-A

Q.2 a) Give a brief account of powder method for crystal structure analysis.
    b) A simple cubic crystal has atomic radius of 1.00 Å. Determine the spacing of planes having Miller indices as (111).
    c) Show that concentration of Frenkle defects in equilibrium at a given temperature is proportional to \( (NNi)^{1/2} \), where \( N \) and \( Ni \) are the number of atoms and interstitial atoms, respectively.

6

Q.3 a) The Hall coefficient for a specimen is \( 3.66 \times 10^{-4} \text{ m}^3 \text{ C}^{-1} \). If the resistivity of specimen is \( 8.93 \times 10^{-3} \text{ Ohm-m} \), calculate the mobility and concentration of charge carriers.
    b) Distinguish between direct and indirect band gap semiconductors.
    c) Discuss any two of the following processes for crystal growth:
       i) Vapour phase epitaxy
       ii) Liquid phase epitaxy
       iii) Czochralski method.

4

10

Q.4 a) What is photoconductivity? Derive an expression for conductivity and gain of a photoconductor using simple model.
    b) State the principle of a photoconductive cell. Describe its construction, working and uses.

10

PART-B

Q.5 a) Derive an expression for Larmor's precession frequency on the basis of Langevin's theory of diamagnetism.
    b) Differentiate between hard and soft magnetic materials.
    c) Discuss briefly ferrimagnetism and antiferromagnetism.

10

6

4

Q.6 a) Give a brief account of experimental survey on superconductivity. Mention its important applications.
    b) Give a brief account of the BCS theory of superconductors.
    c) Derive London equations.

6

6

8

Q.7 a) Explain in brief the basic principles of nanoscience and nanotechnology. Give four important applications of nanomaterials.
    b) Write short notes on:
       i) Carbon nanotubes and their types.
       ii) Laser evaporation method.
       iii) Sputtering.

8

12
End Semester Examination, May 2014  
B. Tech. – Second Semester  
APPLIED MATHEMATICS-II (MA-201 / MA-201A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Find the product of the Eigenvalues of the matrix:  
\[
\begin{bmatrix}
1 & 0 & 0 \\
0 & 3 & -1 \\
0 & -1 & 3
\end{bmatrix}
\]

b) Give an example of a 3x3 matrix of rank 1.

c) Check whether the function:  
\[f(x) = \begin{cases} -x, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}\]

is even or odd in (-\pi, \pi).

d) The Fourier expansion of an odd function has only sine terms. (True/False)

e) Write one dimensional heat equation.

f) Solve the differential equation \[z = px + gy + a^2 b.\]

g) Write the polar form of Cauchy-Riemann equations.

h) Write the poles of \[f(z) = \frac{z^2 - 1}{z^3 + 1}.\]

i) Define a unit step function.

j) Write the Fourier cosine transform of \(f(t)\).  

2x10

PART-A

Q.2  
a) Find the characteristic roots and characteristic vectors of the matrix:  
\[
A = \begin{bmatrix}
8 & -6 & 2 \\
-6 & 7 & -4 \\
2 & -4 & 3
\end{bmatrix}
\]

b) Find the non-singular matrices P and Q such that PAQ is in the normal form for the matrix:  
\[
A = \begin{bmatrix}
1 & 1 & 2 \\
1 & 2 & 3 \\
0 & -1 & -1
\end{bmatrix}
\]

6

c) Check whether the following vectors are linearly dependent or linearly independent.  
\[X_1 = (1, 1, 2, 3), X_2 = (1, 2, 3, 4), X_3 = (2, 3, 4, 9)\]

4

Q.3  
a) Find the Fourier series for \(f(x) = \cos x, \pi < x < \pi\).

b) Find the Fourier series for the function \(f(x) = \begin{cases} 0 ; -2 < x < 0 \\ 1 ; 0 < x < 2 \end{cases}\).

10

Q.4  
a) Solve \(p - 5q = \tan (y + 5x)\).

b) Solve \(9(p^2 + q^2) = 4\).

5

c) A tightly stretched flexible string has ends fixed at \(x = 0\) and \(x = \ell\). At time \(t = 0\), the string is given a shape defined by \(f(x) = \mu (\ell - x)\), where \(\mu\) is a constant and then released. Find the displacement at any point \(x\) of the string at any time \(t > 0\).  

10

P. T. O.
PART-B

Q.5  a) Show that the function \( u = \frac{1}{2} \log(x^2 + y^2) \) is harmonic and find its harmonic conjugate.  

b) Determine the pole of the function \( f(z) = \frac{z^2}{(z-1)^2(z+2)} \) and the residue at each pole. Hence evaluate \( \int \frac{z^2}{(z-1)^2(z+2)} \, dz \) where \( C \) is the circle \(|z|=3\).  

c) Find Laurent's series about \( z = \pi \) for the function \( f(z) = \frac{\sin z}{z-\pi} \).

Q.6  a) Express \( f(x) = \begin{cases} 1 & , 0 \leq x < \pi \\ 0 & , x > \pi \end{cases} \) as Fourier sine integral and hence evaluate \( \int \frac{1 - \cos(\pi \lambda)}{\lambda} \, \text{Sin}(x \lambda) \, d\lambda \).

b) State and prove the change of scale property of Fourier transforms.

c) Find the finite Fourier sine and cosine transforms of \( f(x) = x^3 \), \( 0 < x < 4 \).

Q.7  a) Find \( \mathcal{L}^{-1} \{ x^2 \sin 2t \} \).

b) Find \( \mathcal{L}^{-1} \left\{ \frac{s}{s^2 + 4s + 13} \right\} \).

c) Solve \( \frac{d^2 y}{dt^2} + 3 \frac{dy}{dt} + 2y = \sin t \), where \( y(0) = 0 \), \( y'(0) = 1 \).
End Semester Examination, May 2014
B. Tech. – Third Semester
ELEMENTS OF AERONAUTICAL ENGINEERING (AE-301)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q. 1  
a) How do we achieve short take-off and landing of an aircraft? How do the gliders and the powered gliders take off?  
b) Plot typical pressure distribution on an airfoil in a subsonic flow at low angle of attack. Show the changes that take place when the angle of attack is increased.  
c) What do you understand by Frise ailerons, horn balance and mass balance that are used on control surfaces?  
d) What is pitch of a propeller? What are fixed pitch and variable pitch propellers?  
e) How does a bulk head differ from a frame as a structural member of a fuselage? What do you understand by stressed skin and machined skin?  
f) What are the main functions of spar and ribs?  
g) What are the ranges of VHF and HF communication systems?  
h) What do you understand by magnetic bearing of a station as seen from a flying aircraft?  
i) What is a hydraulic actuator? What are the different types of hydraulic actuators?  
j) What is the purpose of a relief valve and how does it function? Explain with the help of a diagram.

2x10

PART-A

Q. 2  
a) List the differentiating features of a transport aircraft, a fighter aircraft, a helicopter, and a spacecraft.  
b) What are the rotary wing, and the mixed fixed–rotary wing airplanes?  
c) What is the difference between an airship and a hot air balloon when both are used for transportation of human being?  
d) Name any aircraft with swept forward wings that has been test-flown. What is the main advantage of having swept forward wings?  
e) Name any three satellite launch vehicles designed and operated by ISRO till date. Mention at least one salient feature of each.

Q. 3  
a) What are the various types of high lift devices that can be used on an aircraft? Explain configuration and principle of operation of each type.  
b) Name and explain various types of stability for a classical aircraft. Explain the control measures generally employed to obtain stability.  
c) What do you understand by infinite wings and finite wings?

Q. 4  
a) With the help of schematic diagrams, explain the function of a piston engine, turbo-prop engine, turbo-jet engine and its different variants.  
b) With the help of simplified diagrams, explain the functions of a typical solid propellant rocket engine and a typical liquid propellant rocket engine.

PART-B

Q. 5  
a) What are structural components of an aircraft? Describe briefly the function of each component.  
b) Describe the type of loads that different parts of an aircraft are subject to.

P. T. O.
Q.6  a) Describe briefly the operation of a simple radio receiver with a simple block diagram. What changes are introduced in a simple receiver to convert it as VHF super heterodyne communication receiver?  
    b) Describe VOR navigation system with the help of a block diagram.

Q.7  a) Explain the need and working of selector valve and sequence valve. Why and how are the hydraulic reservoirs pressurized?  
    b) Explain typical low pressure and high pressure pneumatic systems which are used in an aircraft.
End Semester Examination, May 2014
B. Tech. – Third Semester
AIRCRAFT ELECTRICAL INSTRUMENTS AND SYSTEMS (AE-302)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Draw discharge rate curve for lead-acid and nickel-cadmium batteries.
   b) Differentiate between fuse and current limiter.
   c) Why carbon piling is used in a rotary inverter?
   d) Define electrical banding.
   e) What is routing?
   g) Define booster coils.
   h) "Nickel cadmium cell is superior to lead-acid cell". State whether the statement is true or false.
   i) Give difference between earthing and grounding.
   j) Name different type of switches used in aircrafts.

PART-A

Q.2
a) Describe the construction and working of lead-acid battery with a suitable diagram.
   b) Write short notes on:
      i) Static inverters.
      ii) Parallel load sharing.

Q.3
a) Explain split busbar system used in aircrafts. What improvement was done in busbar of B737 aircraft?
   b) Write short notes on:
      i) Cable termination.
      ii) Standardizing of distribution.

Q.4
a) Explain under voltage protection systems.
   b) How circuit breakers are used in aircrafts?

PART-B

Q.5
Write notes on:
   a) Instrument transformer.
   b) Control synchros.

Q.6
Explain with neat diagrams:
   a) Electronic display system.
   b) Central warning system.

Q.7
a) Explain turbo starter system.
   b) Explain fire detection and extinguishing systems.
End Semester Examination, May 2014
B. Tech. – Third Semester
CELL BIOLOGY (BT-301A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Define the following terms:
   a) G-Proteins
   b) Resting potential
   c) r-RNA
   d) Acetylcholine
   e) Tumor cells
   f) Microbodies
   g) Microfilaments
   h) Semi-permeable membrane
   i) Pinocytosis
   j) Apoplast

**PART-A**

Q.2 a) What do you know about active transport of nutrients across cell membrane? 10
b) Briefly discuss various membrane proteins. 10

Q.3 a) Explain the role of lysosomes in phagocytosis. 5
b) Draw a comparison between smooth and rough endoplasmic reticulum. 5
c) Discuss in detail various components of cytoskeleton. 10

Q.4 a) “Mitochondria and chloroplast are not parts of the endomembrane system”, Comment on the statement. 5
b) Discuss in detail the chemical energy conversion in mitochondria. 10
c) What role does ribosome play in the cell? 5

**PART-B**

Q.5 a) What do you know about Ras family of G-proteins? 5
b) Explain the role of calcium and NO in cell signaling. 5
c) Give an overview of enzyme-linked cell surface receptors. 10

Q.6 a) Give an account of major causes of cancer. 10
b) Discuss in detail the process of transformation of proto-oncogenes. 10

Q.7 Write short notes on:
   a) Norepinephrine and Epinephrine.
   b) Properties of neurotransmitters.
   c) Structure of Acetylcholinesterase.
   d) Synaptic transmission.
   e) Muscle structure. 2x5
End Semester Examination, May 2014
B. Tech. – Third Semester
MICROBIOLOGY (BT-302)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Define the following terms:
   a) Archaebacteria  
   b) Pili  
   c) Psychrophiles  
   d) Superoxide dismutase  
   e) Anoxygenic photosynthesis  
   f) Conjugation  
   g) Bacteriostatic agent  
   h) Antiseptic  
   i) Lag-phase  
   j) Chemolithotrophs

   PART-A

Q.2 Write short notes on the following:
   a) Haeckel's three-kingdom classification.  
   b) 16S-rRNA technique for classification of microbes.  
   c) Spontaneous generations vs biogenesis.  
   d) Koch's postulates of germ theory.

   Q.3 Give the salient features of the following:
      a) Algae  
      b) Virus  
      c) Eubacteria  
      d) Fungi

   Q.4 Differentiate between the following:
      a) Pour-plating and spreading.  
      b) Log-phase and stationary phase.  
      c) Thermophiles and psychrophiles.  
      d) Synchronous and continuous growth.

   PART-B

Q.5 a) How does anaerobic respiration differ from fermentation?  
     b) Draw a comparison between EMP and ED pathways for glycolysis.  
     c) What do you know about β-oxidation of fatty acids?  
     d) Briefly discuss the photosynthetic bacteria.

Q.6 Discuss in detail genetic recombination in bacteria through transduction.  

Q.7 a) Draw comparison between the following:
      i) Sterilization and disinfection.  
      ii) Autoclave and hot-air oven.
      b) Discuss the structure and mode of action of penicillin.

   2x10

   5x4

   5x4

   5x4

   4

   4

   8

   4

   20

   5x2

   10
End Semester Examination, May 2014
B. Tech. – Third Semester
BIOCHEMISTRY (BT-303 / BT-303A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What do you understand by Gibb’s free energy?
     b) On what factors does the buffering capacity of hemoglobin depend?
     c) How are dextrins formed?
     d) What are peptidoglycans?
     e) How can you assess catalytic power of an enzyme?
     f) How many ATP molecules are produced in one Kreb’s cycle?
     g) Why is pentose phosphate pathway also called hexosemonophosphate shunt?
     h) How many carbon units are removed in each beta-oxidation cycle of lipids?
     i) Mention any two inhibitors of oxidative phosphorylation.
     j) What is the role of phosphoribosyl pyrophosphate (PRPP) in salvage synthesis of nucleotides?

2x10

PART-A

Q.2  a) Explain covalent and non-covalent interactions in biological systems.
     b) Classify amino acids on the basis of their acid-base properties.

10
10

Q.3  a) Describe the basic structure and different forms of glucose with diagrams. Discuss mutarotation in glucose.
     b) Give general structure and functions of sphingolipids and glycosphingolipids.

10
10

Q.4  a) Explain the structure of a t-RNA. Comment on unusual bases found in t-RNA.
     b) Derive Michaelis-Menten equation. Mention the effect of temperature on enzyme activity.

10
10

PART-B

Q.5  a) Explain transamination and deamination reactions in amino acids. Mention the key enzymes of these reactions.
     b) Give detailed description of production of urea from ammonia.

10
10

Q.6  a) Describe the biosynthesis and utilization of, ketone bodies.
     b) Explain glycolytic cycle giving all the reactions and key enzymes. How is it regulated?

10
10

Q.7  a) Describe in detail the de novo synthesis of pyrimidines.
     b) Explain the hypothesis of mitochondrial oxidative phosphorylation.

10
10
End Semester Examination, May 2014  
B. Tech. – Third Semester  
BIOCHEMISTRY (BT-303B)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt **FIVE** questions in **all**; **Q.1 is compulsory**. Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B**. Each question carries equal marks.

Q.1  
(a) How does disulfide bonds contribute to secondary structure of proteins?  
(b) How does hemoglobin act as a buffer?  
(c) Why is sucrose called 'invert sugar'?  
(d) How are sterols different from steroids?  
(e) What makes enzymes thermolabile?  
(f) Name two high energy phosphate compounds other than ATP.  
(g) How are urea cycle and citric acid cycle linked?  
(h) What is the role of pyruvate dehydrogenase complex?  
i) Mention the precursor of cholesterol.  
j) How do uncouplers inhibit the process of oxidative phosphorylation? 2x10

**PART-A**

Q.2  
(a) Derive Henderson-Hasselbalch equation. How can you obtain a titration curve of a weak acid using this equation? 10  
(b) Describe any two purification methods for proteins. 10

Q.3  
(a) Discuss general properties of lipids with special mention of emulsification, saponification and rancidity. 10  
b) What are structural polysaccharides? Give structure and properties of cellulose. 10

Q.4  
(a) What are the types of nitrogenous bases? How do they form nucleosides and nucleotides? Give functions of nucleotides. 10  
(b) What are active sites? Explain the models for enzyme substrate complex formation. 10

**PART-B**

Q.5  
(a) Explain the role of high energy phosphate compounds in metabolism. 10  
(b) Describe decarboxylation and transamination reactions of amino acids. 10

Q.6  
(a) Describe glycogenesis giving its regulation mechanism. What is the energy consumption in this process? 10  
b) Explain the biosynthesis of triacylglycerols giving key enzymes. 5x2

Q.7  
(a) Describe in detail the de-novo synthesis of purines. 10  
(b) Discuss the mechanism of oxidative phosphorylation giving chemical coupling hypothesis. 10
End Semester Examination, May 2014
B. Tech. (Biotechnology) – Third Semester
GENETICS (BT-304A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on the following:
   a) Karyotype
   b) Random union of gametes
   c) Test cross
   d) Hemophilia
   e) Reasons for Mendel's success
   f) Monohybrid cross
   g) Criss-cross inheritance
   h) Repetitive DNA
   i) Physical mutagens
   j) Non-chromosomal genes

   **PART-A**

   Q.2 Discuss the structural organization of eukaryotic chromosome. 20
   Q.3 What are complementary genes? Discuss it with a suitable example. 20
   Q.4 What are chromosomal aberrations? Discuss the various structural and numerical changes in chromosomes. 20

   **PART-B**

   Q.5 How does inheritance of quantitative characters occur? Discuss it by giving one suitable example. 20
   Q.6 Give an account of induced mutations. Illustrate your answer with a suitable example. 20
   Q.7 Write short notes on:
      a) Disputed parentage
      b) Gene frequency
      c) Genetic disease
      d) Human genome

   5x4
End Semester Examination, May 2014
B. Tech. (Biotechnology) – Third Semester
BIOANALYTICAL TECHNIQUES (BT-305 / BT-305A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:
   a) Compare: i) Simple microscope and compound microscope.
      ii) Instrumental error and random error.
   b) What are fluorochromes? Give examples.
   c) Would you use affinity column chromatography as a first purification step? Why?
   d) What are the factors that affect electrophoretic mobility in SDS-PAGE electrophoresis?
   e) State Lambert-Beer’s law.

PART-A

Q.2 a) Explain the following terms:
   i) Precision
   ii) Accuracy
   b) What are the different types of errors in measurement? How would you avoid instrument errors?

Q.3 a) Give a detailed account of specimen preparation in different types of microscopy.
   b) Give principle and instrumentation of differential centrifugation.
   c) How will you isolate chloroplast from a given cell sample?

Q.4 a) With the help of a neat and labeled sketch, explain the principle and applications of HPLC.
   b) Explain the theoretical plate model of column chromatography.

PART-B

Q.5 a) Explain the role of the following in gel electrophoresis:
   i) Stacking gel
   ii) Separating gel
   iii) Protein markers
   iv) Coomassie blue
   b) Describe in detail a method for determination of isoelectric point of proteins.

Q.6 Discuss in detail UV / Visible spectroscopy and its applications.

Q.7 a) What are the applications of radioactive isotopes?
   b) Give a detailed account of:
      i) Nature of radioactivity
      ii) Autoradiography
End Semester Examination, May 2014
B. Tech. (Biotechnology) – Third Semester
BIOCHEMICAL CALCULATIONS (BT-306 / BT-306A)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define and give examples:
   i) Basic   ii) Derived units
   b) Write a balanced equation for the combustion of propane C₃H₈ in oxygen O₂.
   c) Explain what you understand by latent heat and sensible heat.
   d) State the energy balance equation for an adiabatic steady state process.
   e) Why are amino acids amphoteric in nature?
   f) A radionuclide has a half-life of 4.3 x 10⁷ years. What is the rate constant?
   g) How does initial velocity of an enzyme catalyzed reaction change with increasing substrate concentration?
   h) What are the different phases of microbial cell growth?

   **PART-A**

Q.2 a) Neeta dissolved 13.0 g of sodium chloride to make 2 L of aqueous solution. Calculate the molarity.
   b) Explain concept of pH. How are pH and pKa related?
   c) A 50.6 g sample of Mg(OH)₂ (MW 58.3) is reacted with 45.0 g of HCl (MW 36.5) according to the reaction: Mg(OH)₂ + 2HCl → MgCl₂ + 2H₂O. What is the theoretical yield of MgCl₂?

Q.3 a) Calculate the temperature change when 10 kg of water loses 232 kJ of heat.
   (Specific heat H₂O = 4200 J/kg °C)
   b) Define: i) Enthalpy ii) Latent heat iii) Heat of solution iv) Shaft work
   c) Write a note on heat capacity of solids, liquids and gases.

Q.4 a) Calculate the standard enthalpy of combustion of methanol, using the following data:
   \[H^\circ_f(CH₃OH) = -239 \text{ kJ mol}^{-1}, H^\circ_f(CO₂) = -393 \text{ kJ mol}^{-1}\]
   \[H^\circ_f(H₂O) = -286 \text{ kJ mol}^{-1}\]
   b) Compare steady state process and equilibrium process.
   c) Give a general procedure for performing energy balance.

**PART-B**

Q.5 a) ¹³¹I has a half-life of 8.04 days. Assuming you start with a 1.53 mg sample of ¹³¹I, how many mg of ¹³¹I will remain after 13.0 days?
   b) A solution containing aspartic acid (pI = 2.98), glycine (pI = 5.97), threonine (pI = 6.53), leucine (pI = 5.98) and lysine (pI = 9.74) prepared in a 3.0 pH citrate buffer was applied to a cation exchange chromatography column. The column was then eluted and fractions were collected. In what order will the five amino acids elute from the column?
   c) Describe the formation of peptide bond. Briefly explain its structure.

P. T. O.
Q.6  
a) Describe the Michaelis-Menten model. What is the significance of Michaelis-Menten constant?

b) The following data were recorded for the enzyme catalyzed reaction:

<table>
<thead>
<tr>
<th>(S) Substrate concentration Moles</th>
<th>( V ) (velocity of reaction) nmoles.L(^{-1}).min(^{-1} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>(6.25 \times 10^{-6} )</td>
<td>15</td>
</tr>
<tr>
<td>(7.50 \times 10^{-5} )</td>
<td>56.25</td>
</tr>
<tr>
<td>(1 \times 10^{-4} )</td>
<td>60</td>
</tr>
<tr>
<td>(1 \times 10^{-3} )</td>
<td>74.9</td>
</tr>
<tr>
<td>(1 \times 10^{-2} )</td>
<td>75</td>
</tr>
<tr>
<td>(1 \times 10^{-1} )</td>
<td>75</td>
</tr>
</tbody>
</table>

Estimate \( V_{\text{max}} \) and \( k_m \)  

Q.7  
a) Define and explain the following terms:
   i) \( k_s \)
   ii) Specific growth rate
   iii) Doubling time
   iv) Growth yield

b) A solution of potassium dichromate in water contains 13% \( K_2Cr_2O_7 \) by weight. 1000 kg of the solution was evaporated and cooled to 20 °C to get \( K_2Cr_2O_7 \) crystals. If the yield of crystals was calculated to be 80% and the concentration of the remaining solution was 10.3%, find the amount of evaporated water.
End Semester Examination, May 2014
B. Tech. – Third Semester
STRUCTURAL ANALYSIS-I (C-301)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define modulus of elasticity and modulus of rigidity.
   b) What are shear force and bending moment?
   c) Enumerate the types of supports for a beam and number of restraints in each case.
   d) Find static indeterminacy of a two-hinged arch.
   e) State the assumptions made in the analysis of a pin-jointed plane frame.
   f) Draw any four types of roof truss.
   g) Differentiate between column and strut.
   h) What is a conjugate beam?
   i) State the two Mohr’s theorems used in moment area method.
   j) Define slenderness ratio for a long column and a short column. 2x10

PART-A

Q.2 a) Define principal planes and principal stresses. Derive an expression for the stresses on an oblique section of a rectangular body when it is subjected to a direct stress in one plane only. 10
   b) A rectangular beam 60 mm wide and 150 mm deep is simply supported over a span of 6 m. If the beam is subjected to central point load of 12 kN, find the maximum bending stress induced in the beam section. 10

Q.3 a) Explain the point of contraflexure. 6
   b) A simply supported beam 6 m long is carrying a UDL of 5 kN/m over a length of 3 m from the right end. Draw the shear force and bending moment diagrams for the beam and also calculate the maximum bending moment on the section. 14

Q.4 a) Find expressions for radial shear (F) and normal thrust (N) at any section of a three hinged arch. 6
   b) A three hinged parabolic arch of span 20 m and central rise 4 m is loaded with a UDL of 2 kN/m on the left 8 m length. Calculate:
      i) Direction and magnitude of reactions at the hinges.
      ii) B.M, Normal thrust and radial shear at 15 m from the left end. 14

PART-B

Q.5 a) Explain perfect frame, deficient frame and redundant frame. 6
   b) The truss ABC shown in figure 1 has a span of 5 m. It is carrying a load of 10 kN at its apex. Find the forces in the member AB, AC and BC.

14

P. T. O.
Q.6  
   a) Derive the value of critical load for a column with one end fixed and the other free by Euler's column theory.  
   b) A steel rod 5 m long and 40 mm dia is used as a column with one end fixed and the other free. Determine the crippling load by Euler's formula. Take $E = 200 \, \text{GPa}$.  

Q.7  
   a) A wooden beam 140 mm wide and 240 mm deep has a span of 4 m. Determine the load that can be placed at its centre to cause the beam a deflection of 10 mm. Take $E = 6 \, \text{GPa}$, beam is simply supported at its ends.  
   b) Find slope and deflection of a simply supported beam with a central point load by moment area method.
End Semester Examination, May 2014
B. Tech. – Third Semester
BUILDING CONSTRUCTION AND MATERIALS (C-302/C-302A)

Time: 3 hrs Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are various types of dressings in stones?
b) Define a sill.
c) What is a cavity wall?
d) What are the requirements of a good partition wall?
e) What are the requirements of a good foundation?
f) Define trapezoidal combined footing.
g) What are the tests for cement?
h) Define seasoning of timber.
i) Explain the terms: i) Pitch ii) Purlins
j) What are the requirements of good flooring? 2x10

PART-A

Q.2 a) Comparison between brick masonry and stone masonry. 10
b) What do you understand by modular bricks? 5
c) What are the joints in stone masonry? 5

Q.3 a) What precautions do you observe in a cavity wall construction? Explain with sketch detail of cavity wall at foundation level. 10
b) Enumerate various requirements to be fulfilled by a partition wall. Explain concrete partitions with sketches. 10

Q.4 a) What are the causes of failure of foundations? What remedial measures would you adopt? 10
b) Write a short note on shallow foundations. 5
c) List out various methods to increase bearing capacity of soils. 5

PART-B

Q.5 a) Explain various causes of dampness in a building. 5
b) What are the various methods used for damp proofing course? 5
c) Explain with a neat sketch the D.P.C (Damp proofing course) treatment for foundations. 10

Q.6 a) Sketch the structure of timber. Write various defects of timber. 10
b) Define mortars. Requirements of mortar for good plastering. Explain lime and cement mortar. 10

Q.7 a) Define the following terms:
   i) Lean-to-roof   ii) Eaves
   iii) Hip        iv) Rise 10
b) Enumerate various types of flooring materials. Explain the methods of construction of reinforced cement concrete floors. 10
End Semester Examination, May 2014
B. Tech. – Third Semester
FLUID MECHANICS-I (C-303)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
   a) Define Poise.
   b) What are dimensions of kinematic viscosity?
   c) What do you mean by one-two and three dimensional flows?
   d) If \( y = 2xy \), the magnitude of velocity vector at a point \( P(2, -2) \) is ______.
   e) Define stream lines and streak lines.
   f) Differentiate between absolute pressure and gauge pressure.
   g) What is the use of a manometer?
   h) Under what conditions is a venturi meter used?
   i) Separation is caused by ______.
   j) Give the dimensions in \( M, L, T \), system for:
      i) Energy.
      ii) Flow rate.

\[ 2 \times 10 \]

PART-A

Q.2  
   a) Differentiate between:
      i) Liquid and gases.
      ii) Real and ideal fluids.
      iii) Specific weight and volume.
   b) Explain why the dynamic viscosity of liquid decreases with temperature but it increases with increase in temperature in case of gases?
   c) Define surface tension and prove that the \( \Delta \text{p} = \frac{4\sigma}{D} \).

Where \( \Delta \text{p} \) is the pressure difference inside and outside the liquid droplet, \( D \) is the diameter of the liquid and \( \sigma \) is the surface tension between liquid and air.

Q.3  
   a) Differentiate between:
      i) Uniform and non-uniform flows.
      ii) Laminar and turbulent flows.

Make neat sketches where necessary.

b) A pipe \( 25 \text{cm} \) in diameter carrying water branches into pipes of \( 10 \text{cm} \) and \( 20 \text{cm} \) in diameter. The Water in \( 25 \text{cm} \) pipe is \( 2 \text{m/s} \). Find the quantity of water flowing through this pipe. Also find out the velocity of water in \( 10 \text{cm} \) pipe if the velocity in \( 20 \text{cm} \) pipe is \( 1.5 \text{m/s} \).

Q.4  
   a) State and prove Archimedes’s principle. List out any 5 practical problems based on this principle.

b) Explain the stability of the floating body in:
   i) Stable equilibrium.
   ii) Stable equilibrium.
   iii) Unstable equilibrium.
   iv) Neutral equilibrium.

P. T. O.


**PART-B**

Q.5 a) Derive Bernoulli’s equation and list out some of its practical applications.  
   b) Sketch a pitot tube and explain how it is used to measure the local velocity. What  
   are the advantages of 3-holes pitot tube over single hole pitot tube?  

Q.6 a) Explain the characteristics of laminar and turbulent boundary layers.  
   b) For the following velocity profiles in the boundary layer:  
   
   $\frac{U}{u} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^3$  
   $\frac{U}{u} = 2\left(\frac{y}{\delta}\right)^2 - \left(\frac{y}{\delta}\right)^3$  
   
   State whether the flow is:  
   i) Separated.  
   ii) On the verge of separation.  
   iii) Will not be separated  

   c) What do you understand by?  
   i) Smooth and rough boundaries.  
   ii) Local and average friction coefficient.  

Q.7 a) List out various important dimensionless numbers and their significance.  
   b) What is the procedure adopted for finding non-dimensional $\pi$ terms as per  
   Buckingham theorem?
End Semester Examination, May 2014
B. Tech. – Third Semester
SERVEYING-I (C-304 / C-304A)

Time: 3 hrs Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer all questions:
  a) Differentiate between geodetic surveying and plane tabling.
  b) Explain fore bearing and back bearing.
  c) Explain magnetic declination.
  d) Explain mean sea level.
  e) What do you mean by Azimuthal system and Quadrantal bearing system in compass surveying?
  f) Convert 59° 59' 59'' to reduced bearing.
  g) Explain barometric leveling.
  h) Define horizontal equivalent and vertical equivalent in contouring.
  i) Explain chaining face in theodolite surveying.
  j) Give two characteristics of transition curve.

 **PART-A**

Q.2 a) Discuss two principles of surveying.
    b) Describe the indirect ranging in chain surveying.
    c) A distance of 6.5 km was measured by a 20 m chain. After chaining a distance of 2.5 km it is found that the chain is 3 cm too short which was correct in the beginning, further it was found 6 cm too long at the end. Calculate the correct distance.

Q.3 a) Define bearing. What are its two types? Describe with examples.
    b) What is local attraction and what are the causes for it? How can you detect it?
    c) The following bearing was found in compass surveying. Find the corrected and true bearing, if magnetic declination is 15° East.

<table>
<thead>
<tr>
<th>LINE</th>
<th>Fore bearing</th>
<th>Back bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>124° - 50”</td>
<td>302</td>
</tr>
<tr>
<td>BC</td>
<td>65° - 40”</td>
<td>208</td>
</tr>
<tr>
<td>CD</td>
<td>310° - 30”</td>
<td>130° - 30”</td>
</tr>
<tr>
<td>DA</td>
<td>195° - 78”</td>
<td>16° - 32”</td>
</tr>
</tbody>
</table>

Q.4 a) Write down ten characteristics of contours.
    b) The following staff readings were observed successively with a level, the instrument having been moved after 3rd, 6th, and 8th reading: The readings are 2.228, 1.606, 0.988, 2.090, 2.864, 1.252, 0.602, 1.962, 1.044, 2.684 m. Calculate the R.L. of each point by Rise and Fall method.

 **PART-B**

Q.5 a) What is the use of a Theodolite? Write down its types.
    b) Describe temporary adjustment of a Theodolite.
    c) Explain various methods of measurement of horizontal angle.

P. T. O.
Q.6  
a) Describe intersection method of plane tabling.  
b) Find the multiplication constant and additive constant of a tachometer if two 
staffs held vertical at a distance of 50 m and 80 m are 1.2 m and 1.6 m.  
c) What do you mean by a tachometer? Find the distance and elevation formula for 
staff vertical and normal sight.

Q.7  
a) What is the necessity of a curve? Write different types of vertical curve.  
b) Describe the method of setting out of a simple circular curve by deflection 
distances method.  
c) Draw the neat sketch of simple circular curve.
End Semester Examination, May 2014  
B. Tech. – Third Semester  
CONCRETE TECHNOLOGY (C-305)

Time: 3 hrs  
Max Marks: **100**  
No. of pages: 1

Note: **Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B.** Each question carries equal marks.

**Q.1**  
(a) What is concrete? Name its ingredients.  
(b) Define specific gravity of concrete.  
(c) What do you mean by workability? Name any three tests to measure workability.  
(d) What are admixtures?  
(e) Define a nominal mix.  
(f) Classify aggregates based on their size.  
(g) Write any four applications of concrete.  
(h) Define segregation.  
(i) Explain in brief the bulking of the aggregates.  
(j) Define initial and final setting time of cement.  

**PART-A**

**Q.2**  
(a) What do you understand by hydration of cement? Explain in detail the reactions of constituents of cement with water.  
(b) Explain in detail the physical properties of cement. Name any six different types of cement with their applications.  

**Q.3**  
(a) Explain the factors that affect workability of concrete? Explain in detail process of conducting slump test.  
(b) Explain why water cement ratio is an important factor to prevent segregation and bleeding of concrete; Explain Duff Abram’s water cement ratio law and also brief how concretes gains strength with the age of loading.  

**Q.4**  
(a) What do you mean by mix design? What is the purpose of conducting mix design? Differentiate between nominal and standard mixes.  
(b) Explain the step by step design method conducted for proportioning of concrete.  

**PART-B**

**Q.5**  
Explain short notes on the following:  
(a) Accelerators.  
(b) Air entraining mixtures.  
(c) Fly ash.  
(d) Plasticizers.  

**Q.6**  
(a) What do you understand by cold weather concreting? What are the problems faced while placing and setting of concrete in cold weather and brief how the problems can be reduced?  
(b) Explain in detail the polymer concrete and fibre reinforced concrete.  

**Q.7**  
(a) What are the basic considerations for concrete mix design? Explain in detail.  
(b) Write and explain the design steps in ACI mix design procedure.
End Semester Examination, May 2014
B. Tech. – Third / Fifth Semester
STRENGTH OF MATERIALS (C-306 / 306A)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain in brief:
   a) Theorem of parallel axis.
   b) Moment of resistance.
   c) Compression test.
   d) Centroid or centre of gravity.
   e) Eccentricity.
   f) Factor of safety.
   g) Poisson’s ratio.
   h) Lateral strain.
   i) Longitudinal strain.
   j) Volumetric strain.

PART-A

Q.2 a) Write short notes on:
   i) Elastic material.
   ii) Plastic material.
   iii) Isotropic material.
   iv) Ductile material.
   v) Brittle material.
   b) Explain tensile test of a mild steel specimen along with a graph.

Q.3 a) Write short notes on Hooke’s law, modulus of rigidity and modulus of elasticity.

   Prove $K = \frac{mE}{3(m-2)}$.

   b) A bar of 25 mm diameter is subjected to a pull of 55 kN. The measured extension on gauge length of 195 mm is 0.07 mm and change in diameter is 0.0039 mm. Calculate Poisson’s ratio, Young’s modulus of elasticity, rigidity and bulk modulus.

Q.4 a) Calculate the centroid for right angle triangle from the apex. Give formula of centroid for trapezium, semi-circle and sphere.

b) Find the centre of gravity of a channel section 100 mm × 50 mm × 15 mm about the axis 1-2.

P. T. O.
PART-B

Q.5  a) Explain and prove theorem of perpendicular axis and derive moment of inertia of a circular section.  
b) Find the moment of inertia about the centroidal $x-x$ axis of an angle section.

Q.6  a) Explain the theory of simple bending and state the assumptions in the theory of simple bending.  
b) A T-shaped cross-section of a beam shown in the figure below is subject to a vertical shear force of $100\, kN$. Calculate shear stress at important points and draw shear stress distribution diagram.

Q.7  a) Explain and derive symmetrical columns with eccentric loading about two axes.  
b) A rectangular street is $150\, mm$ and $120\, mm$ thick. It carries a load of $180\, kN$ at an eccentricity of $10\, mm$ in a plane bisecting the thickness. Find the maximum and minimum intensities of stress in the section.
End Semester Examination, May 2014
B. Tech. – Third Semester
DISCRETE STRUCTURES (CS-301)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Find the power set of \( N = \{a, b, c, d\} \).
    b) Prove domination law for sets.
    c) The negation of quantified statement \( \exists x[p(x) \rightarrow q(x)] \) is ...............
    d) Prove that \( p \rightarrow (q \rightarrow p) \) is a tautology.
    e) Prove that set of cube roots of unity is cyclic under multiplication.
    f) Find range of \( f \) for \( f(x) = x^2 - 2x - 3 \) where \( f: A \rightarrow B \) and \( A = \{- 2, -1, 0, 1, 2\} \)
    g) Generate truth table for \((P \land \neg Q)^\circ \neg (P \lor Q)^\circ \neg (P \lor Q)\).
    h) Write the inverse relation of \( R = \{(x, y); x \leq y\} \) where \( x, y \in \mathbb{Z} \).
    i) Write the composition table for "multiplication modulo 5" on set \( \{1, 2, 3, 4\} \).
    j) Find the CNF of \((p \leftrightarrow q)\).

\[ 2\times 10 \]

Q.2  a) Let \( R \) and \( S \) be two relations on the set of positive integers \( I \) and \( R = \{(a, 3a); a \in I\} \)
    and \( S = \{(a, a+1); a \in I\} \). Compute:
    i) ROS
    ii) ROR
    iii) ROSOR
    b) Show that:
    i) \( A \times (B \cap C) = (A \times B) \cap (A \times C) \)
    ii) \( (A \cup B) \cap (A \cup B^c) = A \)

\[ 10 \]

Q.3  a) Let \( f: X \rightarrow Y \) be an everywhere defined invertible functions, \( A \) and \( B \) be arbitrary non-empty subsets of \( Y \). Show that \( f^{-1}(A \cup B) = f^{-1}(A) \cup f^{-1}(B) \).
    b) Prove that relation of inclusion on the set \( P(S) \) (Power set of set \( S \)); where \( S = \{a, b, c, d\} \) is a partial order relation. Draw the Hasse diagram also.

\[ 10 \]

Q.4  a) Suppose that we draw a card from a deck of 52 cards and replace it before the next draw. In how many ways can 10 cards be drawn so that the tenth card is a repetition of any of the previous draws?
    b) Find out whether following proposition is a tautology, contradiction and contingency:
    \( (((P \rightarrow (Q \rightarrow R)) \rightarrow (P \rightarrow Q)) \rightarrow (P \rightarrow R) \)
    c) Prove that:
    i) \( ^n\text{P}_r = n!/(n-r)! \)
    ii) \( ^n\text{C}_r = n!/(n-r)!r! \) \( (n \geq r \geq 1) \)

\[ 10 \]

Q.5  a) For the difference equation:
    \[ a_r - 4a_{r-1} + 4a_{r-2} = (r+1)r^2 \]
    Find the total solution where \( a_0 = 2, a_1 = 37/3 \)
    b) Find generating function for:
    \[ 4a_r - 20a_{r-1} + 17a_{r-2} - 4a_{r-3} = 0 \]

\[ P. T. O. \]
Q.6  a) Consider an algebraic system \((\mathbb{Q}, \cdot)\) where \(\mathbb{Q}\) is the set of positive integers and \(\cdot\) is the binary operation defined by:
\[ a \cdot b = (ab)/4 \]
Determine whether \((\mathbb{Q}, \cdot)\) is an abelian group.

b) Discuss Lagrange's theorem.

c) Consider an algebraic system \((\mathbb{I}, +, \cdot)\) where \(\mathbb{I}\) is the set of integers and \(+\) and \(\cdot\) are addition and multiplication, respectively. Determine whether \((\mathbb{I}, +, \cdot)\) is an integral domain.

d) Write short notes on the following:
   i) Normal subgroup
   ii) Homomorphism and isomorphism

Q.7  a) Determine the minimum spanning tree for the following graph using Kruskal's algorithm.

b) Find the shortest path and shortest distance between nodes A and I using Dijkstra's algorithm and show all the steps of your calculation.
End Semester Examination, May 2014  
B. Tech. – Third Semester  
DISCRETE STRUCTURES (CS-301A)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Determine the power set \( P(A) \) of the set \( A = \{a, b, c, d\} \).
b) Consider the sets \( x = \{k, l, m, n\} \) to \( y = \{7, 8, 9, 10\} \). Let \( \delta : x \rightarrow y \) such that \( \delta = \{(k, 7), (l, 8), (m, 7), (n, 8)\} \). Determine whether \( \delta^{-1} \) is a function.
c) Let \( A \) and \( B \) be sets such that \( (A \cap B) \subseteq B \) and \( B \subseteq A \). Draw corresponding Venn diagram.
d) How many people must you have to guarantee that at least 9 of them will have birthday in the same day of the week?  
e) Let \( k(x) : x \) is a two-wheeler, \( l(x) : x \) is a scooter, \( M(x) : x \) is manufactured by Bajaj. Express the following using quantifiers:
   i) Every two wheeler is scooter.  
   ii) There is a two wheeler manufactured by Bajaj that is not a scooter.
f) Solve the difference equation \( 2a_x - 5a_{x-1} + 2a_{x-2} = 0 \) and find particular solution such that \( a_0 = 0 \) and \( a_1 = 1 \).
g) Let \( R \) be an equivalence relation on the set \( A = \{4, 5, 6, 7\} \) defined by \( R = \{(4, 4), (5, 5), (6, 6), (7, 7), (4, 6), (6, 4)\} \). Determine its equivalence classes.  
h) Define a spanning tree with an example.  
i) Define a subgraph with an example.
j) Find the chromatic number of the following graph.  

Q.2  
a) Among the first 500 positive integers:
   i) Determine the integers which are not divisible by 2, nor by 3, nor by 5.  
   ii) Determine the integers which are exactly divisible by one of them.  
b) Prove \( (A \cup B)^c = A^c \cap B^c \).  
c) Determine whether the relation \( S = \{(a, b) : a \geq b\} \) on the set \( R \) of real number is an equivalence relation.  
d) Consider \( f, g \) and \( h \), all functions on the integers by \( f(n) = n^2, g(n) = n + 1, h(n) = n - 1 \). Determine:
   i) \( hofog \).  
   ii) \( gofh \).  

Q.3  
Determine whether the following is a tautology contingency or a contradiction:

a) \( (H \rightarrow (I \land J)) \rightarrow (H \rightarrow I) \)  
b) \( (p \leftrightarrow q) \rightarrow (p \lor q) \lor (\neg p \land q) \)  

2x10  

PART-A  

Q.2  
a) Among the first 500 positive integers:
   i) Determine the integers which are not divisible by 2, nor by 3, nor by 5.  
   ii) Determine the integers which are exactly divisible by one of them.  
b) Prove \( (A \cup B)^c = A^c \cap B^c \).  
c) Determine whether the relation \( S = \{(a, b) : a \geq b\} \) on the set \( R \) of real number is an equivalence relation.  
d) Consider \( f, g \) and \( h \), all functions on the integers by \( f(n) = n^2, g(n) = n + 1, h(n) = n - 1 \). Determine:
   i) \( hofog \).  
   ii) \( gofh \).  

Q.3  
Determine whether the following is a tautology contingency or a contradiction:

a) \( (H \rightarrow (I \land J)) \rightarrow (H \rightarrow I) \)  
b) \( (p \leftrightarrow q) \rightarrow (p \lor q) \lor (\neg p \land q) \)  

P. T. O.
Q.4  a) Determine the:
i) Number of triangles.
ii) Lines that are formed by selecting points from a set of 15 points out of which 8 are collinear.

b) Find the number of permutations that can be formed from the letters of the word ELEVEN.
i) How many of them begin and end with E?
ii) How many of them have three E together?
iii) How many begin with E and end with N?

c) A pair of fair dice is thrown. Find the probability that sum is 10 or greater.
i) 5 appears on the first die.
ii) 5 appears on at least one die.

**PART-B**

Q.5  a) Solve the difference equation \(a_r + 4a_{r+1} + 4a_{r+2} = r^2 - 3r + 5\).

b) Solve the recurrence relation \(a_{r+2} - 3a_{r+1} + 2ar = 0\); by the method of generation function with the initial conditions \(a_0 = 2\) and \(a_1 = 3\).

Q.6  a) Define the following terms with an example:
i) Semi group.
ii) Abelian group.
iii) Ring.
iv) Integral domain.
v) Monoid.

b) Consider an algebraic system \((G,\ast)\), where \(G\) is the set of all non-zero real numbers and \(\ast\) is a binary operation defined by \(a \ast b = \frac{ab}{4}\). Determine whether \((G,\ast)\) is an abelian group.

Q.7  a) Define the following terms with an example:
i) Cut set.
ii) Isomorphic graphs.
iii) Euler circuit.
iv) Complete binary tree.

b) Compute the shortest distance between sound ‘a’ and destination ‘z’ using Dijkstra’s algorithm for following graph:

![Graph Image]

c) Draw the unique binary tree when the Inorder and Postorder traversals are given as follows:

<table>
<thead>
<tr>
<th>Inorder</th>
<th>3</th>
<th>2</th>
<th>5</th>
<th>4</th>
<th>1</th>
<th>7</th>
<th>6</th>
<th>9</th>
<th>10</th>
<th>8</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postorder</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>7</td>
<td>10</td>
<td>9</td>
<td>11</td>
<td>8</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>
End Semester Examination, May 2014
B. Tech. – Third Semester
DATA STRUCTURES AND ALGORITHMS (CS-302)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) List down any four applications of stack.
   b) Why do we use pointer array? Give a reason.
   c) What are the disadvantages of static memory allocation?
   d) Define the following terms:
      i) Complete binary tree
      ii) Extended binary tree
   e) What is the difference between a directed graph and an undirected graph?
   f) What is the time complexity of insertion sort, bubble sort, quick sort and merge sort?
   g) How linear searching is used to search the elements?
   h) Explain LL rotation using a suitable example.
   i) What is a circular linked list?
   j) What are various applications of a queue? 2x10

Q.2
a) Consider the following arithmetic infix expression and convert it into postfix expression: \( A + (B * C - (D/E + F) * G) * H \). Write down the algorithm to convert infix expression into postfix expression. 10
   b) Which data structure is used to implement recursion? Write down an algorithm to implement sum of n element using recursion. 10

Q.3
a) Write an algorithm to insert and delete the elements from a queue. 10
   b) Write an algorithm to insert a node at the end of a linked list. Also explain the process with the help of a diagram. 10

Q.4
a) What is binary search tree? Write an algorithm to insert a node in the binary search tree. 8
   b) What is a binary tree? Write an algorithm for preorder traversal of a binary tree. 8
   c) Consider the following tree to find inorder, preorder and postorder traversal.

   ![Binary Tree](image)

   PART-B

Q.5
a) Write an algorithm for BFS (Breadth-First-Search) traversal. Consider the following graph for traversal using BFS.

   ![Graph](image)

   10
b) Write a Kruskal algorithm to find the shortest path in a graph. Consider the following graph to find minimum distance.

![Graph Diagram]

Q.6  
(a) Write an algorithm to sort the array using selection sort.  
(b) Write an algorithm for merging of two sorted arrays.  
(c) Consider the following elements to sort the list using heap sort elements: 36, 24, 56, 38, 90, 95, 85, 100.

Q.7  
(a) Write an algorithm to search an element in a sorted array using binary search. Consider the following list to search an element 97.  
10, 11, 12, 23, 65, 84, 97, 100, 125.  
(b) What are the various Hash functions used to calculate the address? Explain each one with the help of a suitable example.
End Semester Examination, May 2014
B. Tech. – Third Semester
COMPUTER ARCHITECTURE AND ORGANIZATION (CS-303)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What do you mean by ISA? How does it affect the design of computer systems?
b) Which is better to use: hand-wired control or a micro-programmed control unit?
c) What do you understand by vector processing?
d) Write short notes on:
   i) SIMD
   ii) MIPS
   iii) Virtual memory

PART-A

Q.2
a) What is a flip-flop? Explain serial input and serial output registers.

b) Explain in detail the multilevel view point of a machine in computer organization.

Q.3
a) Draw a diagram of basic computer registers connected together with the help of a common BUS.

b) Differentiate between RISC and CISC computers.

Q.4
a) Give the explanation of the instruction given below and why each of the following micro operation cannot be executed during a single click pulse.
   i) IR ← M [PC]
   ii) AC ← AC + TR
   iii) DR ← DR + AC (AC does not change)

b) How we can enhance performance with the help of pipelining by using the segments of FI, DA, Fo and Ex.

PART-B

Q.5
a) What are three types of mapping procedures when considering the organization of cache memory?

b) Draw a 8 x 8 omega switching network, which has three stages with four switches in each stage. Total 12 switches.

Q.6
a) Explain Flynn’s classification of digital computers in detail.

b) What are addressing nodes? Clearly state how effective address is calculated in the following nodes:
   Relative, Index, Bar + Index, Indirect.

Q.7
a) What is an interrupt? Explain the types of interrupts and also draw a flow chart for an interrupt.

b) Write short notes on: CAR, BD (Branch field), CD (Condition for branch), and AC (Accumulator register).
End Semester Examination, May 2014
B. Tech. – Third Semester
COMPUTER ARCHITECTURE AND ORGANIZATION (CS-303A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
(a) Distinguish between computer architecture and computer organization.
(b) What do you mean by instruction format?
(c) Define sequential circuit.
(d) What do you understand by RISC?
(e) Why do we need control memory for a microcomputer?
(f) What is the function of an accumulator register?
(g) Distinguish between main memory and cache memory.
(h) What do you mean by memory address map?
(i) Define cache hit and miss.
(j) What is pipelining?  2x10

PART-A

Q.2  
(a) Draw the 3:8 line decoder with its truth table.
(b) Explain the adder and subtractor circuits with diagrams.  10

Q.3  
(a) Explain any three address modes with examples.
(b) What do you mean by an instruction cycle? Explain fetch-decode-execute cycle.  10

Q.4  
(a) Explain the register reference instruction and memory reference instruction.
(b) Explain the control unit of a basic computer.  10

PART-B

Q.5  
(a) Why do we need memory hierarchy? Explain the performance metrics of cache memory system.
(b) Explain micro program sequences.  10

Q.6  
(a) Distinguish between MIPS and MFLOPS.
(b) Distinguish between static and dynamic memory.  10

Q.7  
(a) Explain the Flynn's classification of a computer.
(b) What do you mean by concurrency and explain Amdahl's law?  10
End Semester Examination, May 2014
B. Tech. – Third Semester
OBJECT ORIENTED PROGRAMMING SYSTEMS (CS-304)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Differentiate between compile time and run time polymorphism.
b) Write a short note on encapsulation.
c) What is pure virtual function? Give an example.
d) What are the different visibility modes in inheritance?
e) When will you make a function inline and why?

PART-A

Q.2  a) What is object oriented language? How is it different from procedure oriented programming language? Illustrate with an example.
b) Define the following terms:
i) Class ii) Data hiding iii) Polymorphism iv) Object

Q.3  a) What is a constant object? Why do we need it?
b) Write a C++ program to find the roots of a quadratic equation using class method.
c) List some special characteristics of constructor function. Also given an example.

Q.4  a) Write a C++ program to calculate the volume of the cube ($side^3$), volume of cuboid ($l*b*h$) and volume of cylinder ($3.14*r*r*h$) to implement polymorphism using function overloading.
b) Write a C++ program to overload an unary operator.

PART-B

Q.5  a) What is inheritance? Explain multiple inheritance with an example.
b) What is virtual base class? Explain with an example.

Q.6  a) Write a program for binary search using template function.
b) Write a program containing possible exceptions. Use a try block to throw it and a catch block to handle it properly.

Q.7  a) What are input and output streams? Differentiate between ifstream and ofstream classes?
b) Give syntax and use of open() and close() functions.
c) Explain error handling during file operations.
End Semester Examination, May 2014
B. Tech. – Third Semester
OBJECT ORIENTED PROGRAMMING SYSTEMS (CS-304A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define data members, member function, private, public members with suitable examples.
b) What is inline function? Explain.
c) What is an abstract class? Give an example.
d) Explain destructor function with an example.
e) Explain the ways of defining member function in C++ with the help of a suitable example. 4x5

PART-A

Q.2 a) What are advantages of object oriented programming? Discuss some of the essential characteristics of object oriented programming languages. 10
b) Define a class employee with following specifications:
i) id: integer
ii) name: 20 characters
iii) age: integer
iv) address: 50 characters
v) salary: integer
Member function of class employee
vi) getdata() function to accept id, name, age, address, salary of employee
vii) putdata() function to display all the data members on screen 8

c) What is the user defined data type? 2

Q.3 a) Can a Friend function access the private member of a class? Justify your answer. 7
b) What is the use of constructor function in a class? Give a suitable example of constructor function in a class. 8

c) When do we declare a member of a class statics? 5

Q.4 a) Why is it necessary to overload an operator?
b) Create a class rational which represents a numerical value by two integer values: Numerator and denominator. Include the following public member functions:
i) Constructor with no arguments.
ii) Constructor with two arguments.
iii) Overload + operator to add two rational numbers. 12

c) Give the syntax of an operator function. How many arguments are required in the definition of an overloaded unary operator? 5

PART-B

Q.5 a) Explain hybrid inheritance with an example. 10
b) How constructors are used in a derived class? Explain with a suitable example? 10

Q.6 a) What are advantages of using exception handling mechanism in a program? Write a C++ program containing a possible exception and handle it. 10
b) What is a template? Write a program for linear search using template functions. 10

Q.7 a) Discuss the various classes available for file operations. 7
b) How error is handled during file operations? 8
c) What are the functions used for unformatted output operations? 5
End Semester Examination, May 2014
B. Tech. – Third Semester (CSE) / Fourth Semester (IT)
DATABASE MANAGEMENT SYSTEMS (CS-305)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What are the roles and responsibilities of a database administrator?
b) When do we require a weak entity type in an ER diagram?
c) Differentiate between partial and full functional dependency using an example.
d) How does the hierarchical data model differ from the network data model?
e) Differentiate between coarse granularity and fine granularity.
f) What are the different levels of data abstraction?
g) How is transitivity dependency related to 3NF? Give an example.
h) What is the need of entity integrity constraint in a relation?
i) What is the advantage of dynamic hashing over static hashing?
j) Why is shadow paging considered as NO UNDO – NO REDO protocol?

PART-A

Q.2
a) What are the advantages of DBMS over a conventional file processing system?
b) What is a data model? Discuss its various categories using suitable examples.
c) Differentiate between DDL, DML, and DCL.
d) What is an object relational model? How is it different from an object oriented model?

Q.3
a) An INVOICE is written by a SALESREP. Each sales representative can write many invoices, but each invoice is written by a single sales representative. The INVOICE is written for a single CUSTOMER. However, each customer can have many invoices. An INVOICE may include many detail lines (LINE) which describe the products bought by the customer. The product information is stored in a PRODUCT entity. The product’s vendor information is found in a VENDOR entity.
i) Identify entity types with their attributes, their relationships, and constraints.
State assumptions.
ii) Draw an E-R diagram for the above system.
iii) Convert this E-R model to a relational model.
b) Describe DBMS three level architecture. Explain how data independence is achieved.

Q.4
a) You are given the following relational schema:
   Employee (ename, street, city, salary, deductions)
   Works (ename, branch-name)
   Deputation (ename, org-name, returning date)
   Branch (branch-name, city)
i) Formulate the following queries using relational algebra:
   i) Find the names of employees who are working and who live in Mumbai.
   ii) Find the salaries of those employees who work in the branch XYZ.
   iii) Find the names of employees who are working or are on deputation.
II) Formulate the following queries using tuple calculus:
   i) Retrieve the details of employees whose deductions are less than 10% of their salaries and who live in Hyderabad.

P.T.O.
ii) Find the names of all those employees who do not work for the branch ABC.

b) Discuss the different kinds of join operations available in relation algebra. Illustrate with examples.

**PART-B**

Q.5 a) Consider the following relations with primary keys underlines.
Salesperson (SNo, Sname, Designation)
Area (ANO, Aname, ManagerNo)
Product (PNo, Pname, Cost)
I) Define a view ProductArea in SQL which contains the area name and the names of products sold in that area.
II) Answer using SQL
i) Get the names of all the products that are sold.
ii) Get the product numbers which are marketed by atleast two sales persons.

b) You are given the following set of functional dependencies for a relation:
\[ R(A, B, C, D, E, F) \], \[ F = \{ AB \rightarrow C, DC \rightarrow AE, E \rightarrow F \} \].

i) What is the key of this relation?
ii) Is this relation in BCNF? If not, explain why by showing one violation.
iii) Is the decomposition \( (A, B, C, D) (B, C, D, E, F) \) a dependency preserving decomposition?

b) State and illustrate with examples, the three Armstrong’s axioms of functional dependencies. Why are they considered to be sound and complete?

Q.6 a) Differentiate between ordered and unordered file organizations, stating their advantages and disadvantages.
b) What is a B+ tree? How is it different from a B tree?
c) What are the advantages of using an index? What is the difference between a primary index and a secondary index?
d) What are the various techniques used for collision resolution?

Q.7 a) Show using example that, if two schedules are conflict equivalent, then they are view equivalent also.
b) Discuss immediate update and deferred update recovery protocols.
c) Discuss the ACID property of transactions.
d) Consider the following two transactions:
\[ T31 : \text{read}(A); \]
\[ \quad \text{read}(B); \]
\[ \quad \text{If } A = 0 \text{ then } B := B + 1; \]
\[ \quad \text{write}(B); \]
\[ T32 : \text{read}(B); \]
\[ \quad \text{read}(A); \]
\[ \quad \text{If } B = 0 \text{ then } A := A + 1; \]
\[ \quad \text{write}(A); \]
Add lock and unlock instructions to transactions \( T31 \) and \( T32 \), so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock?
e) What benefit does rigorous two-phase locking provide over strict two-phase locking?
End Semester Examination, May 2014  
B. Tech. – Third / Fourth Semester  
DATABASE MANAGEMENT SYSTEMS (CS-305A)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define each of the following with suitable examples:
   i) Weak entity set
   ii) Total participation
   iii) Derived attribute
   iv) Primary key
b) What is a transaction? Describe the ACID properties. Explain the usefulness of each.
c) Explain any four fundamental operations of relational algebra.
d) What is data independence? Explain the role of data independence, explaining the physical and logical data independence.
e) Explain the role of a database administrator in DBMS.

   PART-A

Q.2  a) What are the disadvantages/limitations of a traditional file processing system?  
b) Explain the advantages and disadvantages of DBMS over a traditional file system.
c) Discuss any five functions of a DBMS.

Q.3  a) What do you understand by a data model? Explain the types of data models in DBMS.
b) Draw an ER diagram for a bank database. State the rules to reduce an ER diagram to database tables. Reduce/map the ER diagram for the bank database into database tables.

Q.4  a) Discuss insertion, updation and deletion anomalies in databases along with suitable examples.
b) Define normalization. Explain with appropriate example, when a relation is said to be in 1 NF, 2 NF and 3 NF.
c) What do you understand by key constraints and integrity constraints?

   PART-B

Q.5  a) Consider the following relations: Student (SSN, Name, Dept, Bdate) Course (Course#, (name, Dept), enroll (SSN, Course#, Semester, Grade), Book-Adoption (Course#, Semester, Book-ISBN), Text (Book-ISBN, Book-title, Publisher, Author).
i) Retrieve the names and birthday of students who are in CSE department. 
ii) Retrieve all the courses names in ECE department.
iii) Retrieve the course number, semester, grade of students in CSE department.
iv) Produce a list of textbooks for courses offered by the MECH department.
v) List any department that has all its adopted books published by 'BP publishers'.
b) Write a short note on tuple calculus.

P. T. O.
Q.6  
a) What do you understand by hashing? When does a collision occur? Explain the collision resolving techniques in detail.  
b) Elaborate the insertion, updation, search and deletion operations in  
   - Sequential files  
   - Index sequential files  
   - Direct files.  

Q.7  
a) Define serializability. Explain conflict serializability and testing of conflict serializability along with suitable examples.  
b) What do you understand by a deadlock? Explain deadlock prevention and detection protocols.  
c) Explain shadow paging.
End Semester Examination, May 2014
B. Tech. – Third Semester
DATA STRUCTURES USING JAVA (CS-306)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is the difference between copying and cloning?
    b) What are the differences between string buffer and string builder?
    c) What are object oriented design principles?
    d) Write about generics with an example.
    e) What are the differences between hash set and hash map?
    f) What are the two forms of inheritance?
    g) What is recursion? Explain with an example.
    h) Define binary tree. Name its types.

PART-A

Q.2 a) What is an array? Write a procedure to insert and delete an element from one dimensional array.
    b) Write two procedures to reverse a string.

Q.3 a) Define a construction. Explain constructor overloading with an example.
    b) Define exception and explain with an example. Differentiate between catch and throw.

Q.4 a) Define a linked list. Write the procedure to insert a new node at the beginning of the list.
    b) Write the array implementation of a queue.

PART-B

Q.5 a) Define hashing. What are the different types of hash functions?
    b) Define polymorphism and inheritance with an example.

Q.6 a) Write the algorithm to sort an array using bubble sort. Show sorting using bubble sort 7, 5, 2, 9, 6.
    b) Write the technique used in quick sort with an example.

Q.7 a) Write about the tree traversal with an example.
    b) What are min heap and max heap? Explain a heap sort.

2½x8

10
10
10
10
10
10
10
End Semester Examination, May 2014
B. Tech. – Third Semester
PRINCIPLES OF OPERATING SYSTEMS (CS-403)

Time: 3 hrs

Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Differentiate between multiprogramming and multitasking.
   b) What are system calls and system programs?
   c) What is PCB?
   d) How can we recover from deadlocks?
   e) What are logical and physical address spaces?
   f) Differentiate between paging and segmentation.
   g) What are different types of files?
   h) Write performance issues involved in I/O system management.
   i) What are semaphores?
   j) What are schedulers?

2x10

PART-A

Q.2 a) What is an operating system? Describe the architecture of an operating system. What are the services provided by an operating system?
   b) What is a real time operating system?
   c) What are threads? How can we implement multithreading?
   12
   3
   5

Q.3 a) Consider the following set of processes, with the execution time given in milliseconds:

<table>
<thead>
<tr>
<th>Process</th>
<th>Execution time</th>
</tr>
</thead>
<tbody>
<tr>
<td>P₁</td>
<td>6</td>
</tr>
<tr>
<td>P₂</td>
<td>8</td>
</tr>
<tr>
<td>P₃</td>
<td>7</td>
</tr>
<tr>
<td>P₄</td>
<td>3</td>
</tr>
<tr>
<td>P₅</td>
<td>5</td>
</tr>
</tbody>
</table>

The processes are assumed to have arrived in the order P₁, P₂, P₃, P₄, P₅ all at time 0. Draw the Gantt chart illustrating the execution of these processes using FCFS and RR (quantum-1) scheduling. What is turnaround time and waiting time of each process for each of the scheduling algorithms?

10

b) What are the requirements for the solution of a critical section problem?
   4

c) What are deadlocks? What are the methods to prevent deadlock?
   6

Q.4 a) What is virtual memory? Explain demand paging in detail with an example.
   10

b) What is internal fragmentation and external fragmentation? How can we remove fragmentation?
   4

c) What are different algorithms for page replacement?
   6

PART-B

Q.5 a) What are different allocation methods in files? Explain advantages and disadvantages of each.
   10

P. T. O.
b) Write the operations that can be performed on files.
c) What is directory structure? Explain in detail.

Q.6  
a) Write short notes on:
   i) I/O hardware
   ii) Transforming I/O requests
   iii) Distributed file system

b) What is disk scheduling? What are the algorithms used for disk scheduling?

Q.7  
Explain Windows XP operating system in following context:
a) Design principles
b) Kernel module
c) Process management
d) Scheduling
End Semester Examination, May 2014
B. Tech. – Third Semester
ELECTRONIC DEVICES AND CIRCUITS (EC-301)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define transition capacitance of a P-N junction diode.
   b) Draw construction diagram of varactor diode.
   c) Why one terminal of a transistor is made common between input and output junction?
   d) Derive relation between $\alpha$ and $\beta$.
   e) Define tilt and sag.
   f) What is frequency response of an amplifier? Also define 3dB.
   g) What is cross over distortion? How it can be removed?
   h) How power amplifiers are classified into different classes?
   i) What are the roles of a mixer and a sampler in a feedback amplifier?
   j) Write Barkhausen criteria of oscillations. 2x10

PART-A

Q.2 a) Draw V-I characteristics of a P-N junction diode. Also derive diode current equation. 10
   b) Draw V-I characteristics of tunnel diode and explain its tunneling mechanism. 7
   c) Explain reverse recovery time of a P-N junction diode. 3

Q.3 a) Draw and explain common emitter characteristics of a PNP transistor. 10
   b) Derive an expression for stability factor. Also explain voltage divider biasing. 10

Q.4 a) Derive expressions for lower and upper cut of frequency of two-stage R-C coupled amplifier. 10
   b) Draw a.c. equivalent circuit at mid frequency range of two stage RC coupled amplifier. Also derive expressions for
      i) Input impedance ii) Output impedance iii) Voltage gain 10

PART-B

Q.5 a) Calculate efficiency of class B power amplifier. 7
   b) What is harmonic distortion in an amplifier? Derive an expression for the same. 7
   c) What is a push-pull amplifier? Why are they preferred over normal power amplifiers? 6

Q.6 a) What is the need of a feedback amplifier? Explain advantages of negative feedback. 10
   b) Define feedback topology. Calculate input impedance and output impedance of voltage shunt feedback configuration. 10

Q.7 a) What is an LC oscillator? Derive an expression for frequency of oscillation of Hartley oscillator. 10
   b) Explain an RC phase shift oscillator. Also explain why three R-C network is used. 10
End Semester Examination, May 2014
B. Tech. – Third / Fourth Semester
DIGITAL ELECTRONICS (EC-302 / EC-302A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Attempt any ten questions of the following:
   a) Convert given 11001.010 binary number to its equivalent decimal number.
   b) Subtract 101110 from 11001 using 2's complement method.
   c) Realize OR gate using only NAND gates.
   d) Differentiate between combinational and sequential circuits. Give examples.
   e) How D flip-flop can be implemented using JK flip-flop?
   f) What do understand by modulus of a counter?
   g) Which logic family is fastest? Give reasons.
   h) How ring counter differs from Johnson counter?
   i) Draw the truth table of 3 input XOR gate.
   j) State and explain DeMorgan's theorems.
   k) What is the significance of resolution in A-D convertor? 2x10

PART-A

Q.2 a) Draw the truth tale for full adder, minimize its logic equation and realize the same using logic gates. 8
   b) Using 7 bits even parity hamming code, detect the error, if any in “1010011” set of bits and do the necessary correction wherever required. 8
   c) Compute 100101x101001+101110. 4

Q.3 a) Minimize the following logic function using K-map and realize the same using logic gates \( F(A, B, C, D) = \Sigma m(0, 2, 7, 11, 13, 14) + d(4, 6, 8, 11, 15) \). 8
   b) Implement 16:1 multiplexer using 4:1 multiplexer blocks. 6
   c) What is the difference between PLA and PAL? Explain using an example. 6

Q.4 a) Draw the circuit of a standard TTL NAND gate with totem pole output and explain its working. How is it different from open-collector TTL? 10
   b) Explain the following characteristics for digital logic families:
      i) Power dissipation  
      ii) Noise margin  
   c) Draw the logic circuit of a 2-input CMOS NOR gate. 5

PART-B

Q.5 a) What do understand by race around condition in flip-flops? What are the methods to avoid it? 6
   b) Draw the excitation table for JK flip-flop. 4
   c) Draw the logic block diagram of universal shift register and explain it operation. 10

Q.6 a) How synchronous counter differs from asynchronous counter? Explain. 3
   b) Draw the logic block diagram of a decade synchronous counter using JK flip-flops and explain its functioning using timing waveforms. 10
   c) Draw a logic block diagram of 4 bit binary DOWN asynchronous counter using JK flip-flops. 7

Q.7 a) Explain successive approximation method of A to D convertor with the help of a logic block diagram. 10
   b) Why R-2R binary ladder is preferred over weighted resistor network for D to A conversion? 5
   c) What specifications are used for selection of a particular A-D convertor? 5
End Semester Examination, May 2014
B. Tech. – Third Semester
SIGNALS AND SYSTEMS (EC-303)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Write short notes on the following signals:
   i) Unit step
   ii) Unit ramp
b) Define a signal.
c) What are Dirichlet’s conditions? Describe them.
d) What are the merits of Fourier transform?
e) What is Laplace transform?
f) In which signal ROC is the entire z-plane?
g) What are the advantages and limitations of z-transform?
h) Explain Cross correlation function.
i) What is the conditional probability?
j) What are the representation of the random signals?

\[2 \times 10\]

**PART-A**

Q.2 a) Classify different types of signals with suitable examples. \[5\]
b) Check whether the following systems are linear or not \[2 \frac{dy(t)}{dt} + 5y(t) = x^2(t)\]. \[5\]
c) Find which of the following signals are energy signal, power signals, neither energy nor power signals.
   i) \[u(n) - u(n - 6)\]
   ii) \[\left(\frac{1}{\sqrt{2}}\right)^n u(n)\]
\[5 \times 2\]

Q.3 a) Explain any five properties of Fourier series with suitable examples. \[10\]
b) Find the Fourier transform of the following signals:
   i) \[\sin\omega_n t u(t)\]
   ii) \[e^{i\omega} u(t)\]
\[10\]

Q.4 a) Find the Laplace transform of the signal \[x(t) = e^{-at} u(t) - e^{-bt} u(-t)\] and find its ROC. \[10\]
b) Explain all the properties of Laplace transform. \[10\]

**PART-B**

Q.5 a) Find the z-transform and ROC of \[x(z)\] for \[x(n) = 3(\frac{1}{2})^n u(n) + 2(\frac{1}{3})^n u(n)\] and find the pole-zero location. \[10\]
b) Compare the Laplace transform and z-transform. \[10\]

Q.6 a) Explain joint probability density function. \[7\]
b) Explain continuous random variables. \[7\]
c) Explain central limit theorem. \[6\]

Q.7 a) Explain Ergodic process and Gaussian process. \[10\]
b) Explain power spectral density. \[5\]
c) Explain auto correlation functions. \[5\]
End Semester Examination, May 2014
B. Tech. – Third Semester
ELECTROMAGNETIC FIELD AND WAVES (EC-304 / EC-304A)

Time: 3 hrs Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Give the importance of unit vectors.
b) State Stoke’s theorem.
c) Explain the method of images.
d) Give the limitations of Gauss’s law.
e) Give conditions at boundary for magnetic fields.
f) State Poynting theorem.
g) Find the depth of penetration δ at a frequency of 1.6 MHz in aluminium where
   \( \sigma = 38.2 \, \text{mho/m} \) and \( \mu_r = 1 \).
h) Write down Maxwell equations in phaser form.
i) What is the difference between a transmission line and an ordinary electric network?
j) Define the terms: input impedance and characteristic impedance of a transmission line. 2x10

PART-A

Q.2 a) State and explain the following:
   i) The gradient of a scalar field
   ii) The divergence of a vector field
   iii) The curl of a vector field
   b) State Gauss law using divergence theorem. Express it in differential form. 10

Q.3 a) Develop an expression for electric field intensity \( \vec{E} \) at a point \( P \) due to an infinite straight line charge with a charge density \( \rho \, \text{C/m} \). 10
b) State and explain the electrostatic boundary conditions existing at the boundary between two dielectrics. 5
c) Derive Laplace and Poisson equation. 5

Q.4 a) Derive current density \( \vec{J} \) using Ampere’s circuital law. Derive the relationship between \( \vec{B} \) and \( \vec{J} \). 5
b) State and explain Biot Savart’s law. 10
c) Write a short note on magnetic vector potential. 5

PART-B

Q.5 a) Write down all the four Maxwell equations in point form as well as in integral form and prove any two. 10
b) Deduce the equation of continuity of current \( \text{div} \left( \vec{J} + \frac{\partial \vec{D}}{\partial t} \right) = 0 \) 5

P. T. O.
Q.6  a) With suitable diagrams and mathematical expressions, define and discuss:
   i) Linear polarization
   ii) Circular polarization
   iii) Elliptical polarization
   b) Derive the electromagnetic wave equation for a conducting medium. 15

Q.7  a) Write short notes on any three:
   i) Propagation constant and attenuation constant
   ii) Open and short circuited lines
   iii) Standing wave and reflection losses
   iv) Impedance matching
   v) Smith chart 5x3
   b) Derive the transmission line equations. 5
End Semester Examination, May 2014
B. Tech. – Third Semester
NETWORK ANALYSIS AND SYNTHESIS (EE-301 / EE-301A)

Time: 3 hrs Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) Find the Laplace transform of \( e^{at} \sin \omega t \).
   b) Define Unit impulse function.
   c) If the poles are complex and lying in the left half of s-plane, draw the time response of the system.
   d) Define current transfer ratio of a two port network.
   e) Write down the h parameter representation of a two port network.
   f) What is a Hurwitz polynomial?
   g) Draw constant K low pass and high pass filter.
   h) Define twig and link with reference to graph theory.
   i) Draw the graph of the network in fig.1.
   j) Define characteristic impedance of a filter.

Q.2
   a) Derive an expression for current i(t) when an RL network is subjected to sudden dc voltage.
   b) What are the advantages of Laplace transformers over classical method of solving the differential equation?

Q.3
   a) For the network shown in the figure find \( \frac{V_2(s)}{V_1(s)} \).
   b) What are restrictions on location poles and zeros for driving point functions?

Q.4
   a) Find h-parameter in terms of Z-parameters.
b) Find the Y parameters of the network for the circuit shown in the figure.

![Circuit Diagram]

**PART-B**

Q.5 a) Synthesize both Foster forms of the network with driving point impedance function

\[ Z(s) = \frac{(s^2 + 1)(s^2 + 4)}{s(s^2 + 2)} \]

b) List the properties of RC and RL impedance function.

Q.6 a) Derive the fundamental equation of an ideal \( \pi \) type filter.
b) Design a constant \( k \) low pass \( \pi \) filter section having cut-off frequency 3 kHz and \( Z_0 = 600 \Omega \). Also determine the frequency at which the filter offers attenuation of 20 dB.

Q.7 a) Explain incidence matrix and tie set matrix.
b) For the graph shown in the figure, draw a tree and write down the fundamental circuit matrix and fundamental cut set matrix.

![Graph Diagram]
End Semester Examination, May 2014  
B. Tech. – Third Semester  
ELECTRICAL MACHINES-I (EE-302 / EE-302A)

Time: 3 hrs

Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Why open circuit and short circuit tests are done on a transformer?
   b) What is rating of a transformer? Why it is not in Watts?
   c) Write application of autotransformer.
   d) Draw equivalent circuit of a single phase transformer.
   e) How eddy current losses are reduced?
   f) In which motor stabilizing winding is used and why?
   g) Write down the function of a commutator in DC machines.
   h) Draw OCC curve of a DC shunt generator.
   i) Draw labeled diagram of an SC machine.
   j) To obtain speed higher than rated speed of a DC motor, which speed control method is used?

   2x10

PART-A

Q.2
a) Explain the working of a transformer on no-load and on load using phasor diagrams.
   b) Define voltage regulation and efficiency of a transformer. Derive the conditions for maximum efficiency of a transformer.

   10

Q.3
Write notes on:
   a) Parallel operation and load sharing between two transformers.
   b) What is an autotransformer? Derive an expression for saving of copper in auto transformer as compared to single phase transformer.

   10

Q.4
Define co-energy. Derive an expression for energy balance and force in singly excited magnetic field system.

   20

PART-B

Q.5
a) Explain construction and working principle of a DC generator with a neat diagram.
   b) What is armature reaction? Describe the effects of armature reaction on the operation of DC machines. How it can be minimized?

   10

Q.6
a) What are methods of speed control of DC motors? Explain the field flux control method in DC series and DC shunt motor.
   b) Draw and explain various characteristics of DC series motor.

   10

Q.7
Write short notes on any two:
   a) Swinburne’s test.
   b) Hopkinson’s test.
   c) Dynamic braking.

   10x2
End Semester Examination, May 2014  
B. Tech. – Third Semester  
ELECTRICAL MACHINES-I (EE-302B)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Why CRGO silicon steel is used in transformers?  
b) Name two types of coils used in transformers.  
c) What is the rating of transformer? Why it is not in Watts?  
d) Define: Coenergy.  
e) Which connections can not be used for parallel operations and why?  
f) What are the necessary conditions for the parallel operations of DC generators?  
g) Which law is used to find the direction of current in a DC generator? Explain.  
h) How can you help control the speed of DC motor? Explain with the help of EMF equation.  
i) What is the condition for maximum efficiency of a DC machine?  
j) Draw the power flow diagram for a DC motor.  

PART-A  

Q.2 a) What do you mean by equivalent circuit? Draw and explain the equivalent circuit of a transformer and also its reduced form.  
b) The efficiency of a 20 KVA, 3500/350 V single phase transformer at unity power factor is 98% at rated load and also at half rated load. Determine transformer core loss and full load copper loss.  

Q.3 a) What is an open delta (V-V connection)? State the advantages and disadvantages of it with applications.  
b) What is an auto-transformer? List the advantages and disadvantages and explain copper saving in detail.  

Q.4 Show that the field energy in a linear magnetic system is given by $w_f = \frac{1}{2} \dot{\psi}_i^2 = \frac{1}{2} \dot{\psi}_i$, and hence derive an expression for force and torque in singly excited magnetic field system.  

PART-B  

Q.5 a) What is armature reaction? Describe the effects of armature reaction on the operation of DC machines. How it is minimized?  
b) With a suitable diagram, explain parallel operation of a DC shunt generator.  

Q.6 a) Explain various characteristics of a DC shunt motor. Also give applications of a DC shunt motor.  
b) Explain the working of a 3-point starter with a neat sketch.  

Q.7 Write short notes on any two:  
a) Braking of DC shunt motor.  
b) Swinburne’s test.  
c) Hopkinson test.  

2x10
End Semester Examination, May 2014  
B. Tech. – Third Semester  
ELECTRICAL MEASUREMENTS (EE-303)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Derive an expression for dimensions of potential difference in CGS system.  
b) Define resolution.  
c) What is meant by deflecting torque?  
d) Define creep in energy meters.  
e) What is a wheatstone bridge?  
f) Define flux.  
g) Name methods for calibration of ballistic galvanometer.  
h) How can P.T be tested?  
i) Draw and explain hysteresis loop.  
j) How can resistivity of earth be measured?  
2x10

PART-A

Q.2  
a) Explain the working of moving iron instrument and drive its torque equation.  
10  
b) How can the range of ammeter and voltmeters be extended?  
10

Q.3  
a) Explain working of maximum demand indicator.  
10  
b) Describe construction and working of induction type energy meter.  
10

Q.4  
a) Derive balance equation of Schering Bridge.  
10  
b) Explain working of wien Bridge and derive the balance equation.  
10

PART-B

Q.5  
Explain the working principle of a ballistic galvanometer along with its detailed analysis.  
20

Q.6  
a) How does a potential transformer (P.T.) work? Explain using phasors.  
10  
b) Give testing method explanation for current transformers (C.T.).  
10

Q.7  
a) Describe a Meggar.  
10  
b) Explain single phase electro dynamo-meter type power factor meter.  
10
End Semester Examination, May 2014
B. Tech. – Third Semester
POWER SYSTEM-I (EE-304 / EE-304A)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) Describe surge tank.
   b) Name the main fuels for diesel and nuclear power plants.
   c) What is depreciation?
   d) Define: base load and peak load.
   e) On what factors does corona depend?
   f) Draw the diagram of construction of underground cables showing each layer in it.
   g) What is string efficiency?
   h) What are advantages of bundling of conductors?
   i) Give the classification of overhead transmission lines.
   j) What do you mean by GMD? 2x10

PART-A

Q.2 a) Explain steam power plant with a neat block diagram along with its advantages and disadvantages. 10
   b) What is substation? Explain any two types of substations in detail. 10

Q.3 a) Explain all types of tariff in brief. 10
   b) Define all the terms given below along with their formulae:
      i) Load factor.
      ii) Maximum demand.
      iii) Diversity factor.
      iv) Plant capacity factor.
      v) Demand factor. 2x5

Q.4 a) How insulation failure occurs in an insulator? Write a note on types of insulators. 10
   b) Derive an expression for single-core cable capacitance. 10

PART-B

Q.5 a) Derive an expression for inductance of single stranded conductor and hence solve the given problem:
      A conductor has a radius of 1 cm. Find the inductance at a distance of 2 m from
      the conductor if it is:
      i) Stranded conductor.
      ii) Hollow conductor. 15
   b) Explain the method of voltage control by tap-changing transformer. 5

Q.6 a) A 2-wire DC distribution cable AB is 2 km long and supplies loads of 100 A, 150 A, 200 A, and 50 A situated 500 m, 1000 m, 1600 m and 2000 m from the feeding point A. Each conductor has a resistance of 0.01 Ω per 1000 m. Calculate the

P. T. O.
potential difference at each load point if a potential difference of 300 V is maintained at point A.

b) Describe the 4-wire star-connected unbalanced load distribution system.

Q.7 Write short notes on any two:
   a) Equipment grounding.
   b) Resonant grounding.
   c) Voltage transformer grounding.
   d) Resistance grounding.
End Semester Examination, May 2014
B. Tech. – Third / Fourth Semester
COMMUNICATION ENGINEERING-I (EC-404)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Write the trigonometric form of the Fourier series representation of a periodic signal.
    b) Define the term modulation index for AM.
    c) Define Carson’s rule.
    d) How much power is saved by using SSB-SC as compared to DSB-SC?
    e) Write down various features of wideband FM.
    f) Compare FM and PM.
    g) Write various advantages of RF amplifiers.
    h) Define intermediate frequency and its use in receivers.
    i) Define thermal noise.
    j) What is meant by the term adjacent channel selectivity? 2x10

PART-A

Q.2  a) Define a system. Explain its various types. 10
    b) Draw the block diagram of a communication system and explain the function of each block. 10

Q.3  a) Discuss in detail various properties of Fourier transform. 10
    b) State and prove Parseval’s theorem for energy signals. 10

Q.4  a) Define DSB-SC modulation. Explain the generation of DSB-SC using a ring modulator. 10
    b) How AM can be demodulated by using an envelope detector? 10

PART-B

Q.5  a) Explain the Armstrong method for the generation of FM. 10
    b) Discuss the method of demodulation of FM using a slope detector. 10

Q.6  a) Draw and explain the block diagram of FM receiver. 10
    b) Explain in detail classification of an AM transmitter. 10

Q.7  a) Explain classifications of internal noise. 10
    b) Write short notes on:
       i) S/N ratio
       ii) Noise figure
       iii) Equivalent noise bandwidth
       iv) Noise temperature 2½x4
End Semester Examination, May 2014  
B. Tech. – Third Semester  
MULTIMEDIA AND ANIMATION (IT-301)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define morphing.  
b) Explain the principle of OCR.  
c) What is difference between bitmap and vector images?  
d) Explain sampling theorem.  
e) Difference between analog and digital signals.  
f) What is auto tracing technique?  
g) What is anti-aliasing?  
h) Give advantages and disadvantages of ADSL.  
i) What are various modes of operations in JPEG?  
j) What is Cel animation?  

2x10

PART-A

Q.2 a) Give a brief picture of frame work for multimedia systems.  
b) What are the draw backs of CD- audio and CD-Rom that are overcome by CD-I? Explain.  
c) What are the design goals of ATM? Explain the functioning of ATM. What are the layers used in ATM? Explain any two.  

6

Q.3 a) Explain the architecture and working of JPEG. Which factors explain the performance of JPEG?  
b) Explain different type of image file formats.  

10

Q.4 a) Discuss the role of multimedia in today's business, entertainment and in the field of education.  
b) What are intelligent VR software systems? Name and define same. Explain the toolkits used in VR systems along with the features required by these toolkits.  

10

PART-B

Q.5 a) Discuss the following with suitable diagram/example in context to digital audio:  
i) Sampling rate  
ii) Bit rate  
iii) Quantization error  
iv) Nyquist rate  
v) Signal to noise ratio  
b) What is MIDI? Mention advantages and disadvantages of MIDI over digital audio data.  

2x5

Q.6 a) What is the basic principle of MPEG? Explain the architecture of MPEG in terms of its frames.  
b) How DVI system is implemented? Explain the concept of PLV and RTV. How does the communication between them take places?  

10

Q.7 a) Give the various animation techniques in detail.  
b) Write short notes on:  
i) MAYA  
ii) Macromedia flash  

5x2
End Semester Examination, May 2014
B. Tech. – Third Semester
CAREER SKILLS-I (HM-302)

Time: 2 hrs

Max Marks: 50
No. of pages: 5

Note: The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Tick (✓) the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.

Q.1 A person starting with 64 rupees and making 6 bets, wins three times and loses three times, the wins and losses occurring in random order. The chance for a win is equal to the chance for a loss. If each wager is for half the money remaining at the time of the bet, then the final result is:
   a) a gain of Rs.27
   b) a loss of Rs.37
   c) neither gain nor a loss
   d) a gain or a loss depending upon the order in which the wins and losses occur

Q.2 Nine persons went to a hotel for taking their meals. Eight of them spent Rs.12 each on their meals and the ninth spent Rs.8 more than the average expenditure of all the nine. What was the total money spent by them.
   a) Rs.115
   b) Rs.116
   c) Rs.117
   d) Rs.118

Q.3 Ten different letters of alphabet are given, words with 5 letters are formed from these given letters. Then, the number of words which have at least one letter repeated is:
   a) 69760
   b) 30240
   c) 99748
   d) 42386

Q.4 There are 12 yes or no questions. How many ways can these be answered?
   a) 4096
   b) 2048
   c) 1024
   d) 144

Q.5 A special lottery is to be held to select a student who will live in the only deluxe room in a hostel. There are 100 year-II, 150 year-II and 200 year-I students who applied. Each year-III’s name is placed in the lottery 3 times; each year-II’s name, 2 times and year-I’s name, 1 time. What is the probability that a year-III’s name will be chosen?
   a) 1/8
   b) 2/9
   c) 2/7
   d) 3/8

Q.6 Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is:
   a) 2:5
   b) 3:5
   c) 4:5
   d) 5:4

Q.7 Without stoppages the average speed of a train is 75 kmphr and with stoppages its average speed is 60 kmphr. How many minutes does the train stopped in an hour?
   a) 10
   b) 12
   c) 14
   d) 18

Q.8 A train starts from Delhi at 6:00 am and reaches Ambala Cantt. At 10 am. The other train starts from Ambala Cantt. At 8 am and reached Delhi at 11:30 am. If the distance between Delhi and Ambala Cantt. is 200 km, then at what time did the two trains meet each other?
   a) 8:46 am
   b) 8:40 am
   c) 8:56 am
   d) 8:50 am
Q.9 A and B together can do a piece of work in 12 days, which B and C together can do in 16 days. After A has been working at it for 5 days and B for 7 days, C finishes it in 13 days. In how many days C alone will do the work?
   a) 16   b) 24   c) 36   d) 48

Q.10 12 buckets of water fill a tank when the capacity of each tank is 13.5 ltrs. How many buckets will be needed to fill the same tank, if the capacity of each bucket is 9 ltrs?
   a) 8   b) 15   c) 16   d) 18

Q.11 An accurate clock shows 8 O'clock in the morning. Through how many degrees will the hour hand rotate when the clock shows 2 O'clock in the afternoon?
   a) 144°   b) 150°   c) 160°   d) 180°

Q.12 One morning after sunrise, Sumesh and Ratheesh were standing on a lawn with their backs towards each other. Sumesh's shadow fell exactly towards his left hand side. Which direction was Ratheesh facing?
   a) East   b) West   c) North   d) South

Q.13 Ten years ago, the ages of the members of a joint family of eight people added up to 231 years. Three years later, one member died at the age of 60 years and a child was born during the same year. After another three years, one more member died, again at 60, and a child was born during the same year. The current average age of this eight member joint family is nearest to:
   a) 23 years   b) 22 years   c) 21 years   d) 24 years

Q.14 Last year, there were three sections in the catalyst, a placement company recruitment paper. Out of them 33 students cleared the cut-off in section 1, 34 students cleared the cut off in section 2 and 32 students cleared the cut off in section 3. 10 in students cleared the cut off in section 1 and 2, 9 students cleared the cut off in section 2 and 3, 8 students cleared the cut off in section 1 and 3. The number of students who cleared each section along was equal and was 21 for each section. How many cleared all the three sections?
   a) 3   b) 6   c) 5   d) 7

Q.15 A turtle is crossing a field. What is the total distance (in meters) passes by the turtle?
   Statement X: The average speed of the turtle is 2 meters per minute.
   Statement Y: Had the turtle walked 1 meter per minute faster than his average speed it would have finished 40 minutes earlier.
   a) Statement X alone is enough to get the anser
   b) Both statements X and Y are needed to get the answer
   c) Statement Y alone is enough to get the anser

Q.16 A, B, C and D go for a picnic. When A stands on a weighing machine, B climbs on, and the weight shown was 132 kg? When B stands, C also climbs on, and the machine shows 130 kg? Similarly the weight of C and D is found as 102 kg and that of B and D is 116 kg. What is D’s weight?
   a) 58 kg   b) 78 kg   c) 44 kg   d) 34 kg

Q.17 In a tournament, there are n teams T₁, T₂, ……, Tₙ with n>5. Each team consists of k players, k>3. The following pairs of teams have one player in common: T₁ & T₂, T₂ & T₃, ……, Tₙ₋₁ & Tₙ and T₁ & Tₙ. No other pair of teams has any player in common. How many players are participating in the tournament, considering all the n teams together?
   a) n(k-1)   b) k(n-1)   c) n(k-2)   d) k(k-2)
Q.18 Suppose n is an integer such that the sum of the digits of n is 2, and $10^{10} < n < 10^{11}$. The number of different values for n is:
   a) 11       b) 10       c) 9       d) 8       1

Q.19 The greatest number of four digits which is divisible by 15, 25, 40 and 75 is:
   a) 9000       b) 9400       c) 9600       d) 9800       1

Q.20 Determine the rth term of an A.P. whose 6th term is 12 and 8th term is 22
   a) 3r-7       b) 5r-18       c) 2r-6       d) 5r-9       1

Q.21 A trader marked the selling price of an article at 10% above the cost price. At the
time of selling, he allows certain discount and suffers a loss of 1%. He allowed a
discount of?
   a) 9%       b) 10%       c) 10.5%       d) 11%       1

Q.22 $PQR, P,QS,P,QT,...,P,OQ$
   a) $PQW$       b) $PQV$       c) $P,QU$       d) $P,Q,U$       1

Q.23 What percentage of numbers form 1 to 70 have 1 or 9 in the unit’s digit?
   a) 1       b) 14       c) 20       d) 21       1

Q.24 Two dice are thrown simultaneously. What is the probability of getting two numbers
whose product is even?
   a) $\frac{3}{4}$       b) $\frac{3}{4}$       c) $\frac{3}{7}$       d) $\frac{5}{16}$       1

Q.25 Find the Odd Man Out 10, 25, 45, 54, 60, 75, 80
   a) 10       b) 45       c) 54       d) 75       1

Q.26 In covering a distance of 30 km, Arun takes 2 hours more than Anil. If Arun doubles
his speed, then he would take 1 hour less than Anil. What is Arun’s speed?
   a) 8       b) 5       c) 4       d) 7       1

Q.27 A man rides his bicycle 10 km at an average speed of 12 km/hr and again travels 12
km at an average speed of 10 km/hr. What is his average speed for the entire trip
approximately?
   a) 11.2       b) 10       c) 10.2       d) 10.8       1

Q.28 Raj travelled from a point X straight to Y at a distance of 80 m. He turned right
and walked 50 m, then again turned right and walked 70 metres. Finally he turned right
and walked 50 m. How far is he from the starting point?
   a) 20 metres       b) 50 metres       c) 70 metres       d) 10 metres       1

Q.29 At what time between 5.30 and 6 will the hands of a clock be at right angles?
   a) 43 5/11 min past 5       b) 43 7/11 min past 5       c) 40 min past 5       d) 45 min past 5       1

Q.30 Bob, Peter, Oliver and 2 girls-Raven and Chelsey are to be seated in a row. Raven
often gets sits to left of Bob. No girl sits at extreme positions and middle positions.
Peter always sits at the extreme position. Who sits to the right of Chelsey?
   a) Oliver       b) Bob       c) Peter/Oliver       d) Peter       1
Q.31 In the word ORGANISATION if we exchange first with the second, second with the third, third with fourth and so on till last then what will be the 10th letter from right?
   a) G    b) N    c) A    d) R  1

Q.32 The original price of a car was $23600. Because the car owner thought he could get more money for the car, he increased the price of the car to 160% of its original price. After a week, the car had not sold, so the owner then discounted the price by 20%, the car was finally sold. What price was the car sold for?
   a) 30208 $    b) 37760 $    c) 23600 $    d) 7552 $  1

Q.33 There are two water tanks A and B, A is much smaller than B. While water fills at the rate of one litre every hour in A, it gets filled up like 10, 20, 40, 80, 160 ... in tank B. At the end of first hour, B has 10 litres, second hour it has 20, and so on. If tank A is 1/16 filled after 11 hours, what is the total duration required to fill it completely?
   a) 4 hours    b) 15 hours    c) 14 hours    d) 16 hours  1

Q.34 For school children, a software was designed. In that software, one monkey has to choose balloons. If a monkey chooses 2 at a time and continues picking then 1 balloon is left. If it picks 5 at a time then the remaining is zero, if it picks 6 at a time then remaining is 3. What is the total number of balloons?
   a) 72    b) 75    c) 79    d) 80  1

Q.35 If $3y + x > 2$ and $x + 2y = 3$, what can be said about the value of $y$?
   a) $y = -1$    b) $y > -1$    c) $y < -1$    d) $y = 1$  1

Q.36 In a city, the bus route numbers consist of a natural number less than 100, followed by one of the letters A, B, C, D, E and F. How many different bus routes are possible?
   a) 594    b) 623    c) 524    d) 624  1

Q.37 The probabilities that drivers A, B and C will drive home safely after consuming liquor are 2/5, 3/7 and 3/4, respectively. What is the probability that they will drive home safely after consuming liquor?
   a) 2/7    b) 9/10    c) 3/10    d) 5/7  1

Q.38 4/15 of 5/7 of a number is greater than 4/9 of 2/5 of the same number by 8. What is the half of that number?
   a) 315    b) 325    c) 335    d) 370  1

Q.39 If the number 481*673 is completely divisible by 9, then the smallest whole number in place of * will be:
   a) 2    b) 5    c) 6    d) 7  1

Q.40 Which natural number is nearest to 8485, which is completely divisible by 75?
   a) 8475    b) 8500    c) 8550    d) 8525  1

Q.41 The 'S' of SMART goals means:
   a) significant    b) single    c) specific    d) sincere  1

Q.42 The recipients' email ID should be written-
   a) in the beginning of writing an email
   b) Anytime during writing the email
   c) at the end of writing an email
   d) Does not matter  1
Q.43 Why should you generally not answer your business phone on the first ring?
   a) It's rude
   b) You don't look busy enough
   c) You can ignore any call
   d) It can catch the caller off-guard

Q.44 Setting effective goals helps to-
   a) Directions in life
   b) Being focused
   c) Make a roadmap for oneself
   d) All of the above

Q.45 What is not a part of effective communication?
   a) Sender
   b) Receiver
   c) Message
   d) Schedule

Q.46 Active listening requires-
   a) Listen carefully all the time
   b) Concentrate and ask questions
   c) Have eye contact with the person speaking
   d) Active engagement with the person and their message with appropriate non-verbal cues.

Q.47 Propriety includes-
   a) Greetings
   b) Politeness
   c) Mannerism
   d) Courtesy

Q.48 Which of the following is not an example of a non-verbal gesture?
   a) Signaling OK with hand
   b) Wearing jewelry
   c) Raising your voice
   d) Gesturing in an empty room

Q.49 I am a professional if I am-
   a) Coachable
   b) Innovative
   c) Ethical
   d) All of the above

Q.50 While taking notes, no need to take down the information that is –
   a) Important
   b) Relevant
   c) Credible
   d) Generic
End Semester Examination, May 2014  
B. Tech. – Third Semester  
APPLIED MATHEMATICS (MA-341A)

Time: 3 hrs  
No. of pages: 2

Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Find the derivative of \( x^3 \).

b) If \( f(x) \) and \( g(x) \) are functions of \( x \), write the formula for \( \frac{d}{dx}[f(x)g(x)] \).

c) \( \int f(x)kdx = \int f(x)kdx + \int f(x)kdx \). [True/False]

d) Find \( \int e^{-x}dx \).

e) If \( z \) is a function of two independent variables \( x \) and \( y \), then \( \frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x} \). [True/False]

f) State whether the function \( f(x,y) = x^3 \sin \left( \frac{y}{x} \right) \) is homogeneous or not? If yes, find its degree.

g) For any point \((a,b)\), if \( r_1 - r^2 > 0 \) and \( r < 0 \) then the function has ________ at \((a,b)\).

h) Write the formula for Maclaurin's series expansion.

i) Write the relation between Beta and Gamma functions.

j) What is the greatest rate of increase of \( u = x^2 + y^2 \) at the point \((1,-1,3)\)?  

2x10

PART-A

Q.2 a) Given \( y = e^x + 3 \cos x + 2 \log x \), find \( \frac{dy}{dx} \).

b) Differentiate \( \sqrt{\cos \sqrt{x}} \).

c) If \( y = \log(1 + \cos x) \), prove that \( y_1 y_2 + y_3 = 0 \).

5

10

Q.3 a) Find \( \int (\sin 2x - e^{-x})dx \).

b) Evaluate \( \int \frac{(x+1)(x + \log x)^3}{2x} \)dx.

c) Evaluate \( \int \frac{dx}{5 + 4 \cos x} \).

5

5

10

Q.4 a) If \( x + y + z = u \), \( y + z = uv \), \( z = u v \cdot w \), show that \( \frac{\partial(x,y,z)}{\partial(u,v,w)} = u'v' \).

b) Verify Euler's theorem for the function \( u = \sin \left( \frac{x}{y} \right) + \tan^{-1} \left( \frac{y}{x} \right) \).

10

10

PART-B

Q.5 a) Using Taylor's series prove that: \( e^{x+h} = e^{x} \left[ 1 + h + \frac{h^2}{2!} + \frac{h^3}{3!} + \cdots \right] \).

7
b) If \( y = (\sin^{-1} x)^2 \), prove that \( (1-x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} - 2 = 0 \).

Or

\( (1-x^2)y'' - xy' - 2 = 0 \).

c) Find the extreme values of \( xy(a-x-y) \).

Q.6  
\begin{enumerate}
\item a) Write the definition of beta function and prove that \( \beta(m,n) = \beta(n,m) \).
\item b) Change the order of integration of \( \int_0^a \int_y^a e^{-y} \, dxdy \) and hence solve.
\item c) Evaluate the double integral, \( \int_0^a \int_0^1 (x^2 + xy^2) \, dydx \).
\end{enumerate}

Q.7  
\begin{enumerate}
\item a) The velocity vector is \( \vec{F} = y\hat{i} + 2\hat{j} + xz\hat{k} \), show that the flux of water through the parabolic cylinder \( y = x^2 \); \( 0 \leq x \leq 3 \), \( 0 \leq z \leq 2 \) is \( 69 \text{ m}^3 / \text{sec} \).
\item b) Prove that \( \text{div}(\text{grad} \, r^n) = n(n+1)r^{n-1} \).
End Semester Examination, May 2014

B. Tech. – Third Semester
ENGINEERING MECHANICS (M-301)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Differentiate between statics, kinematics and kinetics.
b) Explain equality and equivalence of vectors.
c) State static indeterminacy.
d) Explain perfect, deficient and redundant frames.
e) Explain different types of stability.
f) Define the term catenary.
g) Explain the term radius of Gyration.
h) Define force and momentum and state relation between both.
i) Write statement for principle of virtual work.
j) Differentiate between potential energy and kinetic energy.

PART-A

Q.2 Determine the forces exerted at the contact points in the figure.

Q.3 Determine the forces in each members of the truss loaded and supported as shown in the figure.

Q.4 a) Determine the centre of gravity of the shaded area formed by the intersection of a straight line and a parabola as shown in the figure.

P. T. O.
b) Determine the polar moment of inertia of the I-section shown in the figure. Also make calculations for the radius of gyration with respect to \( x \)-axis and \( y \)-axis.

```
[Diagram of an I-section with dimensions labeled: 9 m, 1 m, 12 m, 10 m, 3 m, 1 m, 1 m, 1 m.]
```

**PART-B**

Q.5 a) A particle is moving along a circular path in the \( xy \) plane in the figure. When the particle crosses the \( x \) axis, it has the acceleration along the path of \( 5 \text{ m/sec}^2 \) and is moving with the speed of \( 20 \text{ m/sec} \) in the negative \( y \)-direction. What is the total acceleration of the particle?

```
[Diagram of a circle with a particle at \( x \) axis, labeled 2 m, 20 m/sec.] 
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b) A particle is moving in the \( xy \) plane along a parabolic path given as \( y = 1.22 \sqrt{x} \) shown in the figure with \( x \) and \( y \) in meters. At a position A, the particle has a speed of 3 m/sec and has a rate of change of speed of 3 m/sec\(^2\) along the path. What is the acceleration vector of the particle at this position?

```
[Diagram of a particle moving along a parabola with labeled positions and angles.] 
```

Q.6 Two bodies weighing 300 N and 450 N are hung to the ends of a rope passing over an ideal pulley. With what acceleration would the heavier body come down? What is the tension in the rope?

Obtain your solution by using:

i) principle of work and energy
ii) the principle of impulse and momentum
iii) the D'Alembert's principle.

Q.7 A uniform ladder of 300 N weights rests against a smooth vertical wall and a rough-horizontal floor making an angle of 60° with the horizontal. Use the method of virtual work to find the frictional force between the foot of ladder and the rough horizontal floor.
End Semester Examination, May 2014  
B. Tech. – Third Semester  
ENGINEERING MECHANICS (M-301A)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) How is moment of a force about an arbitrary axis determined?  
b) How a force at one point is replaced by a force and a couple at any other point?  
c) What is free body diagram?  
d) Define mass moment of inertia.  
e) Differentiate between statics and dynamics of a particle.  
f) Write D’Alembert’s principle.  
g) What is variational mechanics?  
h) Write Hamilton principle.

PART-A

Q.2  
a) A force $F = 6\hat{i} + 3\hat{j} - 6\hat{k}$ N acts at position (5, 3, 4) m relative to a coordinate systems. What is the moment of the force about the origin?  
b) Briefly describe different types of force systems.

Q.3  
a) Write the equation of equilibrium under coplanar force system.  
b) Find the force in all the members of the truss as shown in the figure.

Q.4  
a) Describe perpendicular axis theorem.  
b) Locate centroid of the following section shown in the figure.

P. T. O.
PART-B

Q.5  a) Explain normal and tangential component of acceleration.  
     b) A motorist travelling at a speed of 70 kmph suddenly applies brakes and halts after  
        skidding 50 m. 
        Determine:  i) the time required to stop the car  
                    ii) coefficient of friction between tyres and the road.  

Q.6  a) Describe the principle of work and energy for a rigid body.  
     b) A glass marble, whose weight is 0.2 N falls from a height of 10 m and rebounds to  
        a height of 8 m. Find the impulse and the average force between marble and the  
        floor, if the time during which they are in contact is \( \frac{1}{10} \) of a second.  

Q.7  Describe the principle of virtual work. Explain the methods of minimum potential  
     energy.
End Semester Examination, May 2014
B. Tech. – Third Semester
THERMAL ENGINEERING-I (M-302)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is meant by thermodynamic equilibrium?
   b) Define a quasistatic process.
   c) What do you understand by critical point?
   d) State the importance of second law of thermodynamics.
   e) What do you mean by C.O.P.?
   f) What is throttling process?
   g) What is H.C.V. and L.C.V. of fuel?
   h) State the Gibbs-Dalton’s law of partial pressure.
   i) What are the limitations of first law of thermodynamics?
   j) What is sensible heat of water? 2x10

PART-A

Q.2 a) Define thermodynamic systems. Differentiate between open, closed and isolated system. 7
   b) Compare heat and work. 6
   c) Explain extensive, intensive and specific properties with examples. 7

Q.3 a) Explain the following terms relating to steam formation:
   i) Latent heat of steam
   ii) Dryness fraction of steam
   iii) Enthalpy of wet steam
   iv) Superheated steam
   v) Saturation temperature 2x5
   b) A sample of steam from a boiler drum at 15 bar is passed through a throttling calorimeter in which pressure and temperature are found to be 1 bar and 120 °C. Estimate the quality of steam taken from the boiler. 10

Q.4 a) Derive an expression for steady flow energy equation. State the assumptions made before the derivation. 10
   b) A fluid expands reversibly behind a piston from initial conditions of pressure 600 kPa and volume 0.03 m³ to a final volume of 0.09 m³. Presuming isothermal conditions, estimate the work done, change in internal energy and heat supplied or rejected by the fluid system. 10

PART-B

Q.5 a) State the Kelvin-Plank and Clausius statements of the second law of thermodynamics and establish the equivalence between them. 8
   b) Explain the concept of available and unavailable energy. When does the system becomes dead? 7
   c) State and explain the principles of increase of entropy. 5

P. T. O.
Q.6  a) Describe with a neat sketch the orsat apparatus used for analyzing the fuel gases from a boiler trial.

b) What are the characteristics of ideal fuel? How do you classify different types of fuels? What are the advantages and disadvantages of various types of fuels?

Q.7  a) State and explain Avogadro’s law. Show that product of gas constant and molecular mass has the same value for all gases.

b) Define compressibility and explain its significance.

c) A vessel contains 10 kg of oxygen, 8 kg of nitrogen and 25 kg of CO₂ at 375 K temperature and 250 kPa pressure. Make calculation for the capacity of the vessel, the partial pressure of each gas present in the vessel and the total pressure in the vessel when the temperature is raised to 450 K.
End Semester Examination, May 2014
B. Tech. – Third Semester
MANUFACTURING TECHNOLOGY-I (M-303 / M-303A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What do you understand by recrystallisation and recrystallisation temperature?
b) Explain the term: plastic flow of metals.
c) What is coining and swaging?
d) Explain wire drawing.
e) What is a butt joint?
f) What are different welding positions?
g) Define a blowhole and porosity.
h) What do you understand by dry sand and green sand?
i) How is permeability test of sand done?
j) What is a drawing process?

PART-A

Q.2 a) What is a pattern? Mention functions of patterns in casting.
b) State the effects of clay and moisture on permeability of moulding sand.
c) Explain all the characteristics of a foundry sand desired for a good casting.

Q.3 a) With the help of a neat sketch, explain the elements of gating system.
b) What are the main factors which are responsible for producing defects in a casting?
c) Step by step, describe the complete procedure of investment casting.

Q.4 a) Explain principle of rolling and also classify rolling units with their explanation.
b) Explain indirect extrusion with the help of a neat sketch.
c) What is drop hammer machine forging? Explain.

PART-B

Q.5 a) What is stretch forming? Explain the method of how stretch forming is done on a sheet metal.
b) Explain compound dies.
c) Why is it necessary to provide proper clearance between the punch and die in a shearing operation? Give reasons.

Q.6 a) Explain the characteristics and uses of three basic oxy-fuel welding flame patterns.
b) What is the principle of arc in electric arc welding?
c) Classify the electrodes used in arc welding. What are the factors considered for selection of electrodes?

Q.7 a) Explain the construction and operation of the following welding methods and also mention their advantages and disadvantages.
   i) Shielded metal arc welding
   ii) GMAW
b) Differentiate between soldering and brazing.
End Semester Examination, May 2014
B. Tech. – Third Semester
FLUID MECHANICS (M-304)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define the following fluid properties:
   i) Specific volume  
   ii) Specific gravity
   b) State Newton’s law of viscosity.
   c) What are dimensionless numbers? State their significance?
   d) Define stream lines, streak lines and path lines.
   e) Define the terms: kinetic energy correction factor and momentum correction factor.
   f) What is a laminar sublayer?
   g) What do you understand by major and minor energy losses in a pipe?
   h) Define flownet.
   i) Define Buoyancy.
   j) Distinguish between laminar and turbulent flows.  2x10

PART A

Q.2  a) Explain the concept of surface tension and derive an expression for surface tension on liquid jet.    10
     b) A circular plate 4 m dia is immersed in water in such a way that its greatest and the least depth below the free surface are 7 m and 3.5 m, respectively. Determine the total pressure on one face of the plate and position of centre of pressure.  10

Q.3  a) Derive continuity equation in three dimensions.  10
     b) The velocity vector in a fluid flow is given \( v = 4x^2i - 20x^2yj + 2tk \). Find the velocity and acceleration of fluid particle at (2, 1, 3) at time t=1.  10

Q.4  a) Derive an expression for Bernoulli’s equation using Euler’s equation, and also state its assumptions.  15
     b) Find the discharge from a 100 mm diameter external mouthpiece, filled to a side of a large vessel if the head over that mouthpiece is 4 m.  5

PART B

Q.5  a) What do you mean by viscous flow? Prove that maximum velocity in a circular pipe for viscous flow is equal to two times the average velocity of the flow.  10
     b) An oil of viscosity 0.1 Ns/m² and relative density 0.9 is flowing through a circular pipe of diameter 50 mm and of length 200 m. The late of flow of fluid through the pipe is 4.5 litre/s. Find the pressure drop in a length of 200 m.  10

Q.6  a) Explain the following:  i) Prandtl mixing length hypothesis
       ii) Separation and control  5x2
     b) What is displacement thickness (\( \delta^* \))? Derive an expression for it.  10

Q.7  a) Find the head lost due to friction in a pipe of diameter 400 mm and length 60 m through which water is flowing at a velocity of 3 m/s using:
   i) Darcy formula
   ii) Chezy’s formula for which C=60. Take kinematic viscosity for water=0.01 Stoke.  10
     b) What is dimensional homogeneity? Find an expression for the drag force on smooth sphere of diameter D, moving with a uniform velocity V in a fluid of density P and dynamic viscosity \( \mu \), using Rayleigh’s method.  10
End Semester Examination, May 2014
B. Tech. – Third Semester
MATERIAL SCIENCE (M-305)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Classify imperfections in metal crystals.
b) Define strain hardening.
c) What is a heat treatment process?
d) Which additives are added to polymers to form plastics?
e) At what temperature nitriding process is carried out?
f) How much carbon is present in eutectoid steel?
g) What type of fracture do ductile metals show?
h) Sketch creep curve.
i) Define Hooke’s law.
j) What is the microstructure of martensite?

PART-A

Q.2  
a) List three main types of crystal structures to which most of the metals belong. Name three metals of each type.

b) Calculate atomic packing factor for body centered cubic crystal.

Q.3  
a) Describe the characteristics of following of iron-carbon carbide phase diagram:
   i) α-ferrite
   ii) Pearlite
   iii) Austenite

b) Explain with examples differences in properties of plain carbon steels and cast irons.

Q.4  
a) Classify and describe various heat treatments of steel.

b) Define the term re-crystallization. Describe the process of Bauschinger process.

PART-B

Q.5  
a) Describe briefly the work hardening, season cracking phenomenon.

b) Differentiate between elastic and plastic deformations.

c) Sketch and describe different types of fractures.

Q.6  
a) Explain various corrosion control methods.

b) Define corrosion. Discuss various types of corrosion occurring in engineering materials.

Q.7  
a) Differentiate between thermoplastic and thermostetting plastics.

b) What are composites? Discuss various types of composites with their properties.

c) Write general properties of ceramics.
End Semester Examination, May 2014
B. Tech. – Third Semester
MATERIALS AND HEAT TREATMENT (M-307)

Time: 3 hrs

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is the range of carbon percentage in low, medium and high carbon steel?
     b) Name the element, which is intentionally added in free cutting steel.
     c) Differentiate between case hardening and surface hardening.
     d) What is hardness, hardening and hardenability of steel?
     e) Name three ceramic materials used in cutting tools.
     f) Give the importance of whisker composites.
     g) Give the units of Brinel hardness and toughness.
     h) What is flame hardening?
     i) Water is the most commonly used quenching medium. Why?
     j) State the significance of martensite. 2x10

PART-A

Q.2  State the important properties and application of the following:
     a) Heat resistant steel
     b) Spring steel
     c) Manganese steel
     d) Free cutting steel
     e) Brass
     f) Bearing material
     g) Cold work tool steel
     h) Hot work tool steel
     i) Grey cast iron
     j) Shape memory alloys. 2x10

Q.3  a) What is a composite material? How are composites classified? State the advantages and limitations of composites. 12
     b) Discuss the mechanical behavior of ceramic materials. 8

Q.4  a) What is creep? Draw a typical creep curve and explain the different stages of creep. 10
     b) Name five important mechanical tests. State the significance of each test. 10

PART-B

Q.5  Describe the mechanism of formation of austenite for an eutectoid steel, hypoeutectoid steel and hypereutectoid steel. 20

Q.6  Explain the following process:
     a) Annealing
     b) Normalizing
     c) Hardening of steel
     d) Tempering of steel 5x4

Q.7  a) Why it is necessary to toughen the core before hardening the case? 5
     b) Why post carburizing heat treatment is necessary for case carburized parts? 5
     c) Compare cyaniding and carbo-nitrilding case hardening process. 10
End Semester Examination, May 2014
B. Tech. – Third Semester
METROLOGY (M-308)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) State the Taylor's principle of limit gauging.
b) Differentiate between line standard and end standard.
c) Define unilateral and bilateral tolerances.
d) What is a snap gauge?
e) What is a sine-centre?
f) What do you mean by an interchangeable assembly?
g) What are the factors which affect surface roughness?
h) Define major diameter and effective diameter of a screw thread.
i) What are the different types of irregularities found in a circular part?
j) Define circular pitch, diametral pitch and module of a gear.

2x10

Q.2 a) Why it is necessary to give tolerance on engineering dimensions?
b) Determine the dimensions, tolerances and allowances for 25 mm hole and shaft pair designated as H/8 e9.
   Given:  i) Upper deviation of 'e' shaft=-11D^0.41
   ii) 26 mm lies in the diameter steps of 18 mm to 30 mm.
   iii) IT7=16 i
   iv) IT 8=25 i

Q.3 a) State the principle of auto-collimator.
b) Explain how a sine bar is used for measuring angle of a small taper block?

Q.4 a) Define the following in connection with surface texture assessment:
   i) Roughness
   ii) Waviness
   iii) Sampling length
   iv) Lay
   v) Ra-value
b) Describe the working principle of a Tomlinson surface metre for the measurement of surface roughness.

Q.5 a) Name the important elements of thread which are required to be measured.
b) Explain with a sketch the three-wire method for measuring effective diameter of an external screw thread. How does it differ from two-wire method?

Q.6 a) State the importance of geometrical accuracy of a manufactured component.
b) Describe in detail the V-block and dial indicator method of testing roundness.

Q.7 a) Name the various elements of a spur gear which are checked for accuracy.
b) Describe the working principle of Parkinson gear tester and state its limitations.

PART-A

5

PART-B

15

15

1x5

15

15

5

15

5

15

5
End Semester Examination, May 2014
B. Tech. – Fourth Semester
AERODYNAMICS-I (AE-401)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on any ten of the following: (word limit 60)
  a) Steady/unsteady flow.
  b) Compressible/incompressible flow.
  c) Viscous/inviscid flow.
  d) Rotational flow.
  e) Vorticity.
  f) Circulation.
  g) Streamline.
  h) Streakline.
  i) Pathline.
  j) Stream function.
  k) Potential function.
  l) Pitot tube.
  m) Coefficient of pressure.
  n) Uniform flow.
  o) Source and sink flow.
  p) Doublet flow.
  q) Vortex flow.

PART-A

Q.2  a) Describe the criteria for two or more flows to be dynamically similar. Also explain the two important similarity parameters.  10
     b) Consider an airfoil at 12° angle of attack. The normal and axial force coefficients are 1.2 and 0.03, respectively. Calculate the lift and drag coefficients.  10

Q.3  a) Consider a velocity field where the $x$ and $y$ components of velocity are given by $u=\text{cx}$ and $v=-\text{cy}$, where $c$ is constant. Obtain the equations of the streamlines.  10
     b) For the above field, calculate the stream function and velocity potential. Using your results show that lines of constant $\Phi$ are perpendicular to lines of constant $\psi$.  10

Q.4  a) A Pitot tube on an airplane flying at standard sea level reads $1.05 \times 10^5$ N/m². What is the velocity of the airplane? Also calculate the pressure coefficient at a point on the surface of wing where velocity is 130 m/s.  10
     b) Describe the significance of elementary flows in aerodynamics.  5
     c) The lift on a spinning circular cylinder in a free stream with a velocity of 30 m/s at a standard sea level conditions is 6 N/m of span. Calculate the circulation around the cylinder.  5

PART-B

Q.5 Write short notes on the following, also give the mathematical significance of the following:
  a) Lift generation by airfoils.
  b) Important characteristics of airfoil.
  c) Thin airfoil theory.
  d) The Kutta Joukowski theorem.  20

P. T. O.
Q.6   a) What is a boundary layer?
      b) With help of diagrams, explain the phenomenon of flow separation on a typical airfoil. In the process also explain the adverse effects of flow separation on airfoil. Also discuss the methods to control flow separation.

Q.7   Explain the following:
      a) Prandtl's classical lifting-line theory.
      b) Non-linear lifting-line method.
      c) Vortex lattice numerical method.
End Semester Examination, May 2014  
B. Tech. – Fourth Semester  
AIRCRAFT STRUCTURES-I (AE-402)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal mark.

Q.1  
(a) Explain principle of superposition.  
(b) Define redundancy.  
(c) Explain the role of longerons and stressed skin structure in fuselage design.  
(d) Explain the concept of unit load method for truss analysis.  
(e) Explain the importance of gust analysis for an aircraft.  
(f) Define strain energy.  
(g) What do you mean by limit load and Ultimate load of any structure?  
(h) What do you mean by shear flow?  
(i) Explain briefly, the stress-strain relationship.  
(j) State the importance of V-n diagram.  

2x10

PART-A

Q.2  
State the Maxwell’s reciprocal theorem. A cantilever 800 mm long with a prop 500 mm from the wall deflects in accordance with the following observations when a point load of 40 N applied to its end:

<table>
<thead>
<tr>
<th>Distance (mm)</th>
<th>0</th>
<th>100</th>
<th>200</th>
<th>300</th>
<th>400</th>
<th>500</th>
<th>600</th>
<th>700</th>
<th>800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deflection (mm)</td>
<td>0</td>
<td>-0.4</td>
<td>-1.5</td>
<td>-2.4</td>
<td>-1.8</td>
<td>0</td>
<td>2.4</td>
<td>4.8</td>
<td>10.5</td>
</tr>
</tbody>
</table>

What is the angular rotation of the beam at the prop due to a 30 N load applied 200 mm from the wall, together with a 10 N load applied 350 mm from the wall? The initial deflected shape of the cantilever is shown below:

(a) Deflected shape of propped cantilever  
(b) Determination of deflection at C

Q.3  
Direct stresses of 160 N/mm² (tension) and 120 N/mm² (compression) are applied at a particular point in an elastic material on two mutually perpendicular planes. The principal stress in the material is limited to 200 N/mm² (tension). Calculate the allowable value of shear stress at the point on the given planes. Determine also the value of the other principal stress and the maximum value of shear stress at the point. Verify your answer using Mohr’s circle.

20

P. T. O.
Q.4 For the truss shown below. Calculate the forces in all bars using method of joints.

Q.5 An aircraft having a total weight of 250 kN and a tricycle undercarriage lands at a vertical velocity of 3.7 m/s, such that the vertical and horizontal reactions on the main wheels are 1200 kN and 400 kN respectively; at this instant the nose wheel is 1.0 m from the ground, as shown in the figure. If the moment of inertia of the aircraft about its CG is $5.65 \times 10^6$ kg$^2$ mm determine the inertia forces on the aircraft, the time taken for its vertical velocity to become zero and its angular velocity at this instant.

Q.6 Determine the deflection of the free end of tip-loaded cantilever beam shown below by using complementary energy method; the bending stiffness of the beam is EI.

Q.7 Calculate shear flows in the web panels and the axial loads in the flanges of the wing rib shown in the figure below. Assume that the web of the rib is effective only in shear while the resistance of the wing to bending moment is provided entirely by the three flanges 1, 2 and 3.
End Semester Examination, May 2014  
B. Tech. – Fourth Semester  
AIRCRAFT STRUCTURES-I (AE-402A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer any ten:
   a) What do you mean by determinate structure?
   b) What do you mean by 'Factor of safety' of any structure?
   c) What do you mean by equilibrium equation for a 3-D structure?
   d) Explain the role of Former and Bulkhead in fuselage design.
   e) Write down any four different loads experienced by an aircraft in flight.
   f) What is a gust? Mention its analysis techniques?
   g) Define the shear centre of a body. What is its general position for a symmetric body?
   h) Explain the concept of neutral plane in the bending of a beam.
   i) What is the importance of equilibrium equation for stress analysis?
   j) What do you mean by Maxwell's reciprocal theorem?
   k) What are the loading problems with wing at high angle of attack?
   l) What do you mean by inertial load on an aircraft?  

PART-A

Q.2 a) Draw the cross section of a wing, mark its essential parts and explain their role in wing structure.  

b) Derive the equation of equilibrium for a 3-D body.  

Q.3 a) For the load applied on a deformable body, where u, v and w represent the deformation in X-axis, Y-axis and Z-axis respectively. Show that:

\[ \gamma_{xy} = \frac{\partial w}{\partial x} + \frac{\partial v}{\partial z} \]

b) Draw the V-n diagram and explain its all the essential regions. Can we have the same flight envelop for two different altitudes of 50 km and 80 km?  

c) An aircraft of weight 150 kN is executing a correctly banked turn of radius 250 m at a velocity of 50 m/s. Calculate the load factor and lift on the aircraft. What will be the effect on load factor if the banking angle is increased further?  
(Take \( g = 10 \text{ m/s}^2 \))

Q.4 Find the internal loads acting on each member of the structure shown in the figure below:

\[ \text{Diagram}
\]

PART-B

Q.5 a) What do you mean by symmetrical bending of a beam? Show that for a symmetrical beam the neutral axis passes through the centroid of area of the cross section and further prove that:

P. T. O.
b) A beam shown below is subjected to a bending moment of $2000\,Nm$ in a vertical plane. Calculate the maximum direct stress due to bending stating the point at which it acts.

Q.6  

a) Determine the deflection of the free end of the tip-loaded cantilever beam shown below by using complementary energy method; the bending stiffness of the beam is $EI$.

b) Determine the force in the members of the pin-jointed framework shown below using virtual load method. Each member has the same cross section area and Young's modulus of elasticity.

Q.7  

Calculate the shear flows in the web panels and the axial loads in the flanges of the wing rib shown in the figure below. Assume that the web of the rib is effective only in shear while the resistance of the wing to bending moment is provided entirely by the three flanges, 1, 2 and 3.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
AIRCRAFT PROPULSION-I (AE-403)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on any ten:
   a) Geometric pitch of a propeller.
   b) Inflow factor.
   c) Advance ratio.
   d) Internal combustion engine.
   e) External combustion engine.
   f) Specific fuel consumption of an IC engine.
   g) Effects of altitude and velocity of aircraft on specific fuel consumption of an IC engine.
   h) Turboprop and turboshaft engines.
   i) Ramjet engines.
   j) Specific thrust.
   k) Specific impulse.
   l) Design parameters of a gas turbine engine.

   2x10

PART-A

Q.2 Explain the following heat transfer processes with help of governing equations:
   a) Conduction
   b) Convection
   c) Radiation

   20

Q.3 a) Explain the working of a typical propeller. With help of a diagram, explain the vital geometric details of a propeller blade.
   b) An aircraft is propelled by a 4.572 m diameter propeller, which produces 35.6 kN of thrust. The aircraft is flying at an altitude where the atmospheric conditions are such that the density of air is 1.03 kg/m³. Using momentum theory compute:
      i) The induced velocity through the disk.
      ii) The final velocity of the flow in the far wake.

   8

Q.4 a) With the help of thermodynamic cycle analysis, explain the working of an ideal internal combustion engine.
   b) An air-standard Otto cycle has a compression ratio of 7.5. At the beginning of compression, $p_1 = 85 kPa$ and $T_1 = 32°C$. The mass of air is 2 gm, and the maximum temperature in the cycle is 960 K.
       Determine:
       i) The net work, in kJ.
       ii) The thermal efficiency.

   10

PART-B

Q.5 a) Using governing equations of fluid mechanics, obtain the equation of thrust produced by a propulsion device and its propulsive efficiency.

   10

P. T. O.
b) A turbojet engine is flying at 200 m/s. The products of combustion achieve an exhaust velocity of 900 m/s. Estimate the thrust and the propulsive efficiency. 10

Q.6 Describe the following:
   a) Describe the requirement of fuels used in an IC engine.
   b) Advantages of liquid fuel
   c) Carburetor 20

Q.7 a) With the help of thermodynamic cycle analysis, explain the working of an ideal turbojet engine.
   10
   b) Air enters a turbojet engine at 0.8 bars, 240 inlet velocity of 1000 km/h (287 m/s). The pressure ratio across the compressor is 8. The turbine inlet temperature is 1200 K and the pressure at the nozzle exit is 0.8 bar. The work developed by the turbine equals the compressor work input. The diffuser, compressor, turbine, and nozzle processes are isentropic, and there is no pressure drop for flow through the combustor. For operation at steady state, determine the velocity at the nozzle exit and the pressure at each principle state. Neglect kinetic energy at the exit of all components except the nozzle and neglect potential energy throughout. 10
End Semester Examination, May 2014
B. Tech. – Fourth Semester
AIRCRAFT MATERIALS (AE-404)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define: Hardness, Britteness, Malleability and Ductility.
    b) Define: Binary phase diagram. Draw the same for iron-carbon.
    c) Classify carbon steel.
    d) What is hot short and cold short in steel?
    e) State Hook’s Law. What is its importance?
    f) Give the nomenclature for Aluminum Alloys.
    g) Define: Martensite, Troostite, Sorbite, Hardened steel.
    h) What is an allotrope? Which are the allotropes of iron? Classify them.
    i) For aluminum alloys, explain: Sand casting, Permanent mold casting, Dies casting.
    j) What is isotropic and anisotropic? What is its importance in composites? 2x10

PART-A

Q.2  a) What types of corrosion are obtained in steel and aluminum alloys? Explain them.
    b) What are alloy steels? Which are the different types of alloy steels and describe them in brief?
    c) Explain annealing and its various types.
    d) Draw and explain Iron-Carbon phase diagram in detail.
    e) Discuss the various factors affecting selection of material in a/c manufacture. 4x5

Q.3  a) What are the different types of corrosion resistant steels? What are the different
types of corrosion that act on such steels? What methods are used to increase
corrosion resistance? What heat treatment methods used for such alloys? 10
    b) What are Inconel and Monel? Describe their properties. What heat treatment
methods are used for them? What are the working properties of each? 10

Q.4  a) What are aluminum alloys? Write difference between wrought and cast aluminum
alloys. Give classification of wrought Al alloys. Explain heat treatment process is
used for them. 10
    b) What are ceramic materials? Write the properties that define their use in a/c.
Describe the manufacturing process used for ceramics. 10

PART-B

Q.5  a) What are composite ceramics? State their types and write briefly on each type.
    Explain the stress strain curve for ceramics. 10
    b) Describe the different manufacturing methods for composite ceramics. Which are
the different types of fibres used in polymeric based composite materials and
explain each? 10

Q.6  a) Write the properties of cast Al alloys. Explain the manufacturing methods used for
    them. Write about the production methods for magnesium. 10

P. T. O.
b) Explain different types of corrosion, factors affecting corrosion and methods used for increasing corrosion. Explain the types of corrosion taking place on Mg alloys and Al alloys.

Q.7 a) Describe the heat treatment used for Mg alloys. Explain how Mg alloys are manufactured.
    b) Draw the stress train diagram for ductile metals and explain it in detail.
    c) Explain alloying theory and binary diagram in detail. Explain the heat treatment of alloy/carbon steels with a required diagram.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
THEORY OF MACHINES (AU-404)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What do you understand by degrees of freedom?
b) Define gear ratio.
c) What is hammer blow?
d) Define module and pitch circle diameter.
e) What is a gyroscope?
f) Define static balancing.
g) Kennedy's theorem
h) Sliding pair
i) Addendum circle.
j) Principle of virtual work.

PART-A

Q.2  a) Determine whether the following chains are kinematic or not:

(i)

(ii)

(iii)

b) Explain any one inversion of a single slider crank chain.

Q.3  Figure shows a pin-joint 4 bar linkage having following dimensions: AD=4 m, AB=1.5 m, CD=2.5 m, BC=3 m, \( \angle BAD=60^\circ \).
Link AB revolves at 25 rpm, find:
i) Angular velocity of link BC.
ii) Angular velocity of link CD.

P. T. O.
Q.4  a) A pinion of 32 involute teeth and 4 mm module drives a rack. The pressure angle is 20°. The addendum of both pinion and rack is the same. Determine the maximum permissible value of the addendum to avoid interference. Also find the number of pairs of teeth in contact.  

b) Classify and explain the different types of cams.  

PART-B

Q.5 A four link mechanism with the following dimensions is acted upon by a force \( F = 80 \text{ N} \) on link DC as shown in the figure AD=50 mm, AB=40 mm, BC=100 mm, DC=75 mm, DE=35 mm. Determine the input torque \( T \) on link AB for the static equilibrium of the mechanism for given configuration.

Q.6 Explain the following:  
a) Piston driving thrust. 
b) Engine shaking forces.  
c) Crank shaft torque.  
d) Indicator diagram.  

Q.7 Four masses \( m_1, m_2, m_3, \) and \( m_4 \) are 200 kg, 300 kg, 240 kg and 260 kg are resolving with the corresponding radii of rotation are 2.0 m, 0.15 m, 0.25 m and 0.3 m, respectively and the angles between successive masses are 45°, 75° and 135°. Find the position and magnitude of balance mass required, if its radius of rotation is 0.2 m.
End Semester Examination, May 2014
B. Tech. – Third / Fourth Semester
BASICS OF AUTOMOBILE ENGINEERING (AU-405)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:
   a) Define a coupe.
   b) What is the function of thermostat valve in cooling system?
   c) What is M.P.F.I. system?
   d) What is the function of cut-out relay?
   e) What is the function of clutch?
   f) Explain a shock absorber.
   g) What is trailing shoe?
   h) Define toe-out.
   i) What is the function of tread in the tyre?
   j) What is the function of a distributor?

   PART-A

   Q.2 a) Explain advantages of front-wheel drive over rear-wheel drive with the help of a neat sketch.   10
   b) Write short notes on:
      i) Differential
      ii) U joint
      iii) Propeller shaft

   Q.3 a) With the help of a neat sketch, explain the working of splash lubrication systems used in engines.  
      b) Write short notes on:
         i) Charging system
         ii) Lighting system

   Q.4 a) What is the necessity of a transmission in a vehicle? Explain with the help of total resistance tractive effort curve.  
      b) With the help of a neat sketch, explain construction and working of single plate helical coil spring clutch.

   PART-B

   Q.5 a) What is the function of steering gears? Explain the working of a rack and pinion type of steering gear.  
      b) Explain five characteristics of leaf and coil springs, each.

   Q.6 a) Explain the construction and working of hydraulic braking system of Maruti Alto Car.  
      b) Differentiate between:
         i) Leading shoe and trailing shoe
         ii) Air brakes and vacuum brakes

   Q.7 a) Discuss with the help of a simple sketch, the construction of various types of disc wheels.  
      b) Write short notes on:
         i) Wheel balancing
         ii) Tubeless tyres.
End Semester Examination, May 2014  
B. Tech. – Fourth Semester  
FUELS AND LUBRICANTS (AU-406A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain briefly:
   a) Hydrogenation
   b) Alkylation.
   c) Iodine value
   d) Saponification number
   e) Factors affecting the delay period
   f) Chemical delay
   g) Advantages of hydrogen as an I.C. engine fuel
   h) Benzol as a fuel
   i) Lubricating emulsions
   j) Boundary lubrication

   **PART-A**

   Q.2 a) With help of a neat sketch, explain the refining process of petroleum.  
   b) Explain volatility with the help of distillation curves of gasoline.

   Q.3 Write short notes on:
   a) Aniline point
   b) Conradson apparatus
   c) Decomposition stability
   d) Corrosion stability

   Q.4 a) With the help of a neat sketch, explain the different stages of combustion in an S.I. engine.
   b) Discuss different factors affecting flame speed in an S.I. engine.

   **PART-B**

   Q.5 a) With the help of a neat sketch, explain how hybrid vehicle functions.
   b) Give a brief account of CNG being used as an alternative fuel in an S.I. engine.

   Q.6 a) How are lubricants classified? Give an example.
   b) Synthetic lubricants have added advantage over the natural lubricants. Explain.

   Q.7 Explain the following types of lubrication:
   a) Boundary lubrication.
   b) Elasto hydrodynamic lubrication.
   c) Extreme pressure lubrication.
   d) Hydrostatic lubrication.

   2x10  
   10  
   10  
   5x4  
   10  
   10  
   10  
   10  
   5x4
End Semester Examination, May 2014
B. Tech. – Fourth Semester
MOLECULAR BIOLOGY (BT-401 / BT-401A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer the following:
   a) With regard to DNA replication, define the term bidirectional replication.
   b) If RNA polymerase I and RNA polymerase II were missing from eukaryotic cell, what types of genes would not be transcribed.
   c) In eukaryotes, what types of modification occur to pre mRNA.
   d) How the bacterial DNA becomes compacted?
   e) What is an Okazaki fragment? In which strand of DNA are Okazaki fragments found?
   f) What is the significance of modified bases in tRNA?
   g) How does a eukaryotic ribosome select its start codon?
   h) Is it possible for nonautonomous transposable elements to move? If yes, explain how?
   i) What are the characteristics of a highly repetitive DNA?
   j) What is the difference between a structural gene and a non structural gene?

2x10

PART-A

Q.2 Briefly discuss the following:
   a) Cot curve of eukaryotes.
   b) Organization of eukaryotic chromosome.
   c) Differences between A, B and Z DNA.

7
7
6

Q.3 a) Briefly describe the three types of sequences within bacterial origins of replication that are functionally important.
   b) Discuss the various mechanisms that exist in a cell to repair its damaged DNA.

8
12

Q.4 Describe the important events that occur during the three stages of gene transcription in bacteria. Which proteins play critical roles in the three stages?

20

PART-B

Q.5 Represent diagrammatically the organization of the genes involved in lactose utilization and discuss their transcriptional regulation.

20

Q.6 a) Describe the structural features that all tRNA molecules have in common.
   b) What are the three stages of translation? Discuss the main events that occur during these three stages.

5
15

Q.7 What are transposons? Discuss the mechanism of replicative and conservative transposition.

20
End Semester Examination, May 2014
B. Tech. – Fourth Semester
IMMUNOLOGY (BT-402A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer the following:
   a) Differentiate between primary lymphoid organs and secondary lymphoid organs.
   b) What is meant by the term opsonization?
   c) All immunogens are antigens but not all antigens are immunogens. Justify the statement.
   d) What are idiotypic determinants?
   e) What is the difference between radial immunodiffusion and double immunodiffusion?
   f) What antigens do cytotoxic T (Tc) cells recognize?
   g) How does IgG differ from IgM?
   h) What are the four cardinal signs of inflammation?
   i) What is degranulation?
   j) Why immediate and delayed type hypersensitivity reactions are named so? 2x10

PART-A

Q.2 a) Discuss the structure and function of any two secondary lymphoid organs. 15
   b) Explain the characteristic attributes of adaptive immunity. 5

Q.3 Summarize the pathways to activate the complement system mentioning the complement cascade. Is the order of protein interaction important? 20

Q.4 a) Describe the basic structure of class I and class II major histocompatibility complex. In what fundamental ways do they differ? 10
   b) How heavy chain DNA undergoes rearrangements? 10

PART-B

Q.5 a) What are adjuvants? What is their mode of action? 5
   b) Discuss the ways through which viruses can evade the host defence mechanisms. 15

Q.6 Briefly explain:
   a) Direct ELISA. 7
   b) Immunodiffusion. 7
   c) RIA. 6

Q.7 a) Discuss the biochemical events that occur during type I hypersensitivity. 12
   b) Explain the development of the severe hemolytic disease of the newborn (erythraeblasts fetalis). Which type of hypersensitivity is this? Explain shortly how this condition may be treated. 8
End Semester Examination, May 2014  
B. Tech. – Fourth Semester  
INDUSTRIAL MICROBIOLOGY (BT-403)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What are secondary metabolites? Give an example.  
b) Define the term: ‘Bio transformation’.  
c) Name the microbial strains used for production of vinegar and amylases.  
d) Differentiate between white and red wines.  
e) What are β-lactam antibiotics?  
f) What is the core molecule of penicillins?  
g) Define ‘Auxotrophic Mutants’.  
h) Name two vitamins produced via fermentation process.  
i) What do you mean by ‘Malting’?  
j) Name two important biopolymers produced at large scale.  

2x10

PART-A

Q.2  
da) Submerged fermentation and solid-state fermentation.  
b) Primary and Secondary metabolites.  
c) Upstream and downstream processing.  
d) Aerobic and anaerobic fermentation.  

5x4

Q.3  
a) Discuss in detail the ‘Protoplast-Fusion’ technique and explain its role in strain improvement process.  

10

b) Give the characteristic features of an ideal strain for large scale processes.  

10

Q.4  
Give a detailed account of wine-making process.  

20

PART-B

Q.5  
Discuss in detail the structure, mode of action and large scale production of an antibiotic.  

20

Q.6  
a) What do you know about Phosphate-solubilizing biofertilizers?  

10

b) Briefly explain the mode of action and industrial production of viral biopesticides.  

10

Q.7  
Give a detailed account of cost and investment decisions pertaining to large scale fermentation process.  

20
End Semester Examination, May 2014
B. Tech. – Fourth Semester
BASICS OF CHEMICAL ENGINEERING (BT-404)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define:
   i) Rate constant
   ii) Activation energy
   iii) Order of reaction
b) Compare Bingham plastic body and Pseudoplastic body.
c) Explain briefly:
   i) Uniform flow
   ii) Non-uniform flow.
d) Find the Reynolds number if a fluid of viscosity 4 Ns/m² and relative density of 900 kg/m³ through a 20 mm pipe with a velocity of 2.5 m/s. State whether the flow is laminar or turbulent.
e) Explain the advantage of counter current over co-current flow in heat exchangers.
f) Describe simultaneous heat and mass transfer.
g) What are the applications of crystallization?
h) What do you understand by precision and sensitivity of and instrument?

PART-A

Q.2
a) Consider the following data for the reaction \( \text{A} + \text{B} \rightarrow \text{C} \).

<table>
<thead>
<tr>
<th>Run #</th>
<th>Initial [A] ((\text{M}))</th>
<th>Initial [B] ((\text{M}))</th>
<th>Initial rate ((\text{M/s}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.00</td>
<td>1.00</td>
<td>(1 \times 10^{-2})</td>
</tr>
<tr>
<td>2</td>
<td>2.00</td>
<td>2.00</td>
<td>(2 \times 10^{-2})</td>
</tr>
<tr>
<td>3</td>
<td>4.00</td>
<td>2.00</td>
<td>(2 \times 10^{-2})</td>
</tr>
</tbody>
</table>

What is the order of the reaction with respect to A and overall order of the reaction? 6
b) Describe the kinetics of first order reactions. 6
c) Explain the working of an ideal batch reactor. What are the advantages and limitations of the batch reactor? 8

Q.3
a) Classify the fluids on the basis of rheology. Explain the types of fluids in detail by giving suitable examples. 10
b) Derive Bernoulli’s equation. 10

Q.4
Write short notes on:
a) Radiant heat transfer
b) Thermal conductivity.
c) Fouling factors in heat transfer equipments.
d) Types of heat exchangers 5×4

P. T. O.
PART-B

Q.5  a) What are the factors that affect rate of diffusion?  
     b) Explain the process of gas-liquid mass transfer.  
     c) Derive an expression for the mass transfer of a solute A in two immiscible liquids.  

Q.6  a) Types of conveyers  
     b) Solid-Solid mixers  
     c) Vacuum crystallizers  
     d) Freeze drying  

Q.7  a) Differentiate between feedback control systems and feed forward control systems.  
     b) Describe the working of any one device used for measurement of flow rate.  
     c) Explain the different types of devices used for measurement of level.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
BASICS OF CHEMICAL ENGINEERING (BT-404A)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) How does temperature of reaction affect rate constant K? 3
b) Consider the following reaction \( A \rightarrow B \) as zero order reaction. Plot a graph illustrating the change in concentration of A with time as the reaction progresses. 3
c) Define:
   i) Down time.
   ii) Steady state.
d) Define and give units of:
   i) Dynamic viscosity.
   ii) Dilution rate.
e) What are the factors that affect heat transfer by conduction? 4
f) Explain the analogy between heat and mass transfer. 2
g) What is the need of reference junction in a pH probe? 2

PART-A

Q.2 a) The acid catalyzed bromination of acetone is given by following equation:
   \[ CH_3COCH_3 + Br_2 \rightarrow CH_3COCH_2Br + H^+ + Br^- \]
   The rate of disappearance of bromine was measured for several different concentrations of acetone, bromine and hydrogen ions as given in the following table:

<table>
<thead>
<tr>
<th>Rate, M/sec^-1</th>
<th>[Acetone], M</th>
<th>[Br_2], M</th>
<th>[H^+], M</th>
</tr>
</thead>
<tbody>
<tr>
<td>6x10^-5</td>
<td>0.30</td>
<td>0.050</td>
<td>0.050</td>
</tr>
<tr>
<td>6x10^-4</td>
<td>0.30</td>
<td>0.100</td>
<td>0.050</td>
</tr>
<tr>
<td>1.2x10^-4</td>
<td>0.30</td>
<td>0.050</td>
<td>0.100</td>
</tr>
<tr>
<td>3.2x10^-4</td>
<td>0.40</td>
<td>0.050</td>
<td>0.200</td>
</tr>
<tr>
<td>8x10^-5</td>
<td>0.40</td>
<td>0.050</td>
<td>0.050</td>
</tr>
</tbody>
</table>

   Find the rate law for the reaction. What are the value and units of rate constant? 10
b) Explain the design and operation of an ideal batch reactor. Mention the benefits and disadvantages of batch reactor systems. 10

Q.3 a) Derive Bernoulli's equation.
b) Explain the following types of flow:
   i) Steady flow.
   ii) Uniform flow.
   iii) Laminar flow.
   iv) Turbulent flow
   8

Q.4 a) Explain the mechanism of heat transfer by:
   i) Conduction
   ii) Convection
   iii) Radiation 10
b) Explain with suitable diagram the various configurations of heat transfer equipment in a bioreactor. 10

P. T. O.
Q.5  a) Describe the variables that can be manipulated to increase the diffusive mass transfer.
    b) Write short notes on:
        i) Film theory,
        ii) Gas-liquid mass transfer.

Q.6  Write short notes on:
    a) Solid-Solid mixing.
    b) Crystallization.
    c) Distillation.
    d) Adsorption.

Q.7  a) Describe any one equipment used for the measurement of:
        i) Flow rate.
        ii) Pressure.
    b) Describe the principle of:
        i) Feed forward.
        ii) Cascade control systems.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
THERMODYNAMICS OF BIOPROCESSES (BT-405A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write explanatory notes on:
   a) Thermodynamic equilibrium
   b) Chemical potential and chemical coupling
   c) Concept of flux and force
   d) Diffusion
   e) Difference between heat and work. 4x5

PART-A

Q.2 a) Explain the equation of steady flow energy in a system. 10
   b) Explain the effect of temperature on free energy change. 10

Q.3 a) Explain the second law of thermodynamics and what thermodynamic property emerged from it. 10
   b) Explain the thermodynamic potential and Gibbs equation for a closed system. 10

Q.4 a) Explain the differential relation for thermodynamic potentials. 12
   b) Gibbs relation in an open system-Explain. 8

PART-B

Q.5 a) Explain Fick’s law of entropy production. 10
   b) Write in detail about constitutive equation. 10

Q.6 a) Explain Einstein relation of diffusion. 10
   b) Describe the thermodynamics of passive transport across membranes. 10

Q.7 Explain the following:
   a) Oxidative phosphorylation 10
   b) Biological clocks 5
   c) Routes to chaos 5
End Semester Examination, May 2014
B. Tech. – Fourth Semester
STRUCTURAL ANALYSIS-II (C-401)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is a statically indeterminate structure? Give an example.
b) State Castigliano’s first theorem.
c) Define carry-over factor and carry-over moment.
d) Write the relations to determine pressure on the end of an analogous column.
e) What is a linear arch?
f) Check determinacy of a two-hinged arch.
g) What is unsymmetrical bending?
h) Write general cable theorem specifying the notations used.
i) Explain three-hinged stiffening girder.
j) How does sign conventions used in moment distribution method differ from bending of simple beams? 2x10

PART-A

Q.2 a) Calculate the central deflection and the slope at ends of a simply supported beam carrying a uniformly distributed load of \( \omega \) per unit length over the whole span. Use Castigliano’s first theorem. 10
b) A continuous beam of two equal spans of length L each is uniformly loaded over its entire length. Find the magnitude R of the middle reaction by using Castigliano’s second theorem. 10

Q.3 a) A beam ABC, 10 m long, fixed at ends A and C is continuous over joint B and is loaded as shown in the figure. Using slope deflection method, compute the end moments and plot the bending moment diagram. Take constant EI for both the spans.

\[ \begin{align*}
A & \quad 5 \text{kN} \\
& \quad 3 \text{m} \\
B & \quad \Delta \\
& \quad 2 \text{m} \\
& \quad 2.5 \text{m} \\
C & \quad 8 \text{kN} \\
& \quad 2.5 \text{m} \\
& \quad 4 \text{m} \\
E & \quad I & \quad \text{constant}
\end{align*} \]

b) Draw the bending moment diagram of beam same as above by moment distribution method. 8

Q.4 a) Write properties of a symmetrical analogous column.
b) A beam AB of span L is fixed at both the ends and carries a udl of \( w/\text{length} \). Using the column analogy method, compute the fixed end moments. 6 14

PART-B

Q.5 a) Calculate the horizontal thrust for a two-hinged parabolic arch of span L and rise h subjected to a point load W at the crown. 10
b) Determine temperature effects in case of a three-hinged and a two-hinged arch. 10

P. T. O.
Q.6  a) Determine the centroidal principal moment of inertia of an equal angle section 50 mm x 50 mm x 10 mm.
    b) Write a short note on shear centre.

Q.7  a) Derive an expression for horizontal reaction for a cable supporting a udl beginning from general cable theorem.
    b) A light cable 18 m long is supported at two ends at the same level. The supports are 16 m apart. The cable supports three loads of 8, 10 and 12 N dividing the 16 m distance in four equal parts. Find the shape of the string and tension in various portions.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
STRUCTURAL ANALYSIS-II (C-401A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is an influence line?
  b) Draw influence line for shear force at a given section of a simply supported beam.
  c) State Castigliano’s second theorem.
  d) State the law of reciprocal deflections.
  e) Write stiffness of a propped cantilever and a simply supported beam.
  f) Write advantages of a fixed beam over a simply supported beam.
  g) What is elastic centre?
  h) Check determinacy of a two hinged arch vs a three hinged arch.
  i) Write formula to account for temperature stresses in the cable.
  j) What is a three hinged stiffening girder? 2x10

PART-A

Q.2  
a) Draw influence line diagram for reactions for simply supported beams with overhang on both sides. 10
  b) Two wheel loads, 80 kN and 200 kN spaced 2 m apart move on a girder of span 16 m. Find the maximum positive and negative shear force at a section 4 m from the left end. Any wheel load can lead the other. 10

Q.3 Find the forces in the members of the frame shown in the figure. All the members have the same cross-sectional area and are of the same material.

Q.4 A continuous beam \( ABC \) consists of two spans, \( AB = 4 \text{ m} \) and \( BC = 3 \text{ m} \), the end \( A \) being fixed. The span \( AB \) carries a point load of 80 kN at 1 m from \( A \) while the span \( BC \) carries a point load of 60 kN at 1 m from \( C \). \( I_{ab} : I_{bc} = 2 : 1 \). Find the support moments and draw the bending moment diagram by moment distribution method. 20

PART-B

Q.5  
a) What is the basis of column analogy method?
  b) A fixed beam of span \( L \) carries a point load \( W \) at mid span. Determine the fixed end moments by column analogy method. The beam is of uniform section. 6 14

P. T. O.
Q.6  
a) Determine horizontal thrust for a two hinged arch.

b) A two hinged semicircular arch of radius \( R \) carries a concentrated load \( W \) at the crown. Show that the horizontal thrust at each support is \( W / \pi \). Assume uniform flexural rigidity.

Q.7  
The three hinged stiffening girder of a suspension bridge of span \( 120 \) m is subjected to two point loads of \( 240 \) kN and \( 300 \) kN at distances \( 25 \) m and \( 80 \) m from the left end. Find the shear force and bending moment for the girder at a distance of \( 40 \) m from the left end. The supporting cable has a central dip of \( 12 \) m. Find also the maximum tension in the cable and draw the B.M.D. for the girder.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
FLUID MECHANICS-II (C-402)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Differentiate between hydrodynamically smooth and rough pipes.
     b) What do you mean by hydraulic mean depth?
     c) Sketch hydraulic gradient line and total energy line along with the height formula.
     d) What do you understand most economical cross section?
     e) What is critical flow?
     f) What is actual depth?
     g) State criteria for classification of turbines.
     h) State different parts of Pelton wheel.
     i) Name the main characteristics curves.
     j) What is static lift?

2x10

PART-A

Q.2  a) Derive general velocity distribution equation for turbulent flow in pipes.
     b) A rough pipe of 15 cm diameter carries oil (\( \rho = 920 \text{ kg/m}^3 \)). It is observed that the velocity is 1.6 m/s at 3.0 cm from the wall surface and velocity gradient is 5.5/s.

Determine:
   i) Boundary shear stress (\( \tau_0 \))
   ii) Pipe roughness
   iii) Rate of flow through the pipe
   iv) Friction factor of the pipe

Assume the flow is fully turbulent.

10

Q.3  a) Explain flow through siphon and determine the inlet leg.
     b) A pipe carrying water suddenly increases from 10 cm in diameter to 20 cm. Find out loss of head due to sudden increase in diameter if the discharge of water through the pipe is 150 l/s. Also find out the pressure difference between two sections. Also find out the power lost due to sudden expansion.

10

Q.4  a) i) Differentiate between uniform and non-uniform flow through open channel with all cases and diagram.
     ii) Derive most economical cross-section for a rectangular channel.
     b) Derive Chezy’s formula for finding discharge through open channel.

5x2

PART-B

Q.5  a) Describe all water profiles along with diagrams.
     b) Derive a dynamic equations of gradually varied flow for a non-uniform open channels flow condition.

10

Q.6  a) The Pelton wheel is working with overall efficiency of 90% when running at 800 RPM. Taking \( \frac{D}{d} = 10 \) and \( C_\phi = 0.98 \) and \( \frac{U}{V_1} = 0.45 \). Find out the BHP of the turbine. The number of jets used is 3. The head available is 1000 m.

10

P. T. O.
b) What is a draft tube? State types of draft tubes and discuss the theory of a draft tube.

Q.7  
a) i) State effects of cavitation in a centrifugal pump.  
ii) Derive expression for specific speed of centrifugal pump.

b) A single acting reciprocating pump, having a bore of 12 cm diameter and a stroke of 25 cm length, discharge 150 litres of water per minute at 40 r.p.m. Neglecting losses, find:
   i) Theoretical discharge in litres/min
   ii) Coefficient of discharge
   iii) Slip of the pump
End Semester Examination, May 2014
B. Tech. – Fourth Semester
SURVEYING-II (C-403)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define trigonometrical leveling?
   b) What is the object of geodetic triangulation?
   c) What is data input?
   d) Define independent quantity.
   e) Define weight of an observation.
   f) Define celestial sphere.
   g) What do you understand by the term: the sensible horizon?
   h) Define photogrammetric surveying.
   i) Define the terms principal distance and focal plane.
   j) What do you understand by remote sensing and classify remote sensing? 2x10

PART-A

Q.2 a) How will you determine the difference in elevation? Explain any one method in detail. 10
   b) Define coefficient of refraction. 2
   c) An instrument was set up at P and the angle of elevation to a vane 4 m above the
      foot of the staff held at Q was 9° 30’. The horizontal distance between P and Q
      was known to be 2000 metres. Determine the R.L. of the staff station at Q, given
      that the R.L. of instrument axis was 2650.38. 8

Q.3 a) Discuss triangulation figures and criteria for selection of figure. 10
   b) Discuss classification of triangulation system. 10

Q.4 a) Discuss general principles of least square? 10
   b) Define direct and indirect observations, normal equation, true error and most
      probable value. 10

PART-B

Q.5 a) Express the following angles in hours, minutes and seconds:
   i) 50°12’48"
   ii) 8°18’6”
   iii) 258°36’30” 5
   b) Express the following hours etc into degree, minutes and seconds:
   i) 4h 34m 13s
   ii) 1° 11m 39s 5
   c) Discuss Napier’s rule of circular parts. 10

Q.6 a) Define following:
   i) Oblique photograph  ii) Flying height  iii) Flight line iv) Axis of tilt
   b) Discuss radial line method of plotting and principles of radial line resection and
      intersection. 10

Q.7 a) Explain the idealized remote sensing system with a neat diagram. 10
   b) Discuss G.I.S. and G.P.S. 10
End Semester Examination, May 2014
B. Tech. – Fourth Semester
DESIGN OF CONCRETE STRUCTURES-I (C-404)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) If the effective depth, total depth and diameter of tension bar are 500 mm, 450 mm and 20 mm, respectively. Find out the clear cover? Show all dimension on a neat sketch.
b) Write down various assumption of working stress method.
c) Explain steel beam theory.
d) Why do we provide doubly reinforced beam?
e) Write down the IS guidelines about spacing of vertical shear stirrups.
f) What do you mean by floating foundation?
g) Two slabs are of dimension 2.8 m x 5.9 m, 6 m x 6 m respectively, state which is one way slab and which is two way slab?
h) What do you mean by pedestal?
i) In a circular column of 70 cm diameter with clear cover of 40 mm and diameter of main bars are 16 mm, what should be the minimum number of main bars in it?
j) Draw a neat and leveled sketch of buttress type retaining wall. 2x10

PART-A

Q.2
Solve by working stress method:
a) The cross section of a singly reinforced concrete beam is 300 mm wide and 450 mm deep up to the centre of the reinforcement. It consists of three bars of 12 mm diameter. If the stresses in concrete and steel are not to exceed 7 N/mm² and 230 N/mm², determine the moment of resistance of section. Assume m=13.33. 12

b) A rectangular beam reinforced on both side is 350 mm wide and 550 mm deep. The centres of steel are 50 mm from respective edges. If the limiting stresses in concrete and steel are 7 N/mm² and 230 N/mm², respectively; determine the steel areas for a bending moment of 90 kNm. Take m=13.33. 8

Q.3
Solve by limit state method:
a) A simply supported beam 300 mm wide and 450 mm deep to centre of tensile reinforcement. Determine the limiting moment of resistance and also limiting area of reinforcement. Use M 20 concrete and Fe 415 steel. 10

b) A T beam of flange width 1100 mm flange thickness 10 mm and rib width 250 mm has an effective depth of 500 mm. The beam is reinforced with 4 bars of 22 mm diameter. Find the ultimate moment of resistance. Use M 20 concrete and Fe-250 steel. 10

Q.4
a) A RCC beam of span 6 meter is 300 wide and 500 mm deep to centre of tensile reinforcement which consists of 4 bars of 22 mm dia. The beam carries a load of 30 kN/m inclusive of its own weight. Design the shear reinforcement by stirrups. Use M 20 concrete and Fe-415 steel. Assume \( \tau_c = 0.30 \) N/mm² for given percentage of steel in this problem. 10

P. T. O.
b) Find reinforcement required for a rectangular beam section with following data:
   Size of beam = 300 mm x 600 mm
   Concrete mix = M20
   Steel grade = Fe 415
   Factored moment = Mf = 120 kNm
   Factored torsion = Tfu = 45 kNm
   Factored shear = Sfu = 105 kN
   Assume τe = 0.30 N/mm² for given percentage of steel in this problem.

**PART-B**

Q.5 a) Design a R.C. slab for a room having inside dimension 3 m x 7 m size. The thickness of supporting wall is 350 mm. The slab carries 70 mm thick lime concrete at it top, the unit weight of which may be taken as 20 kN/m³. The live load on the slab may be taken as 2 kN/m². Assume the slab to be simply supported at the ends. Use M20 and Fe 415 steel for it.

b) Design a R.C. slab for a room measuring 5m x 6 m size. The slab is simply supported on all the four edges, with corner held down and carries a superimposed load of 3000 N/m², inclusive of floor finish etc. Use M20 and Fe -415 and IS code method. (αu = .072 and αs = .056)

Q.6 a) Draw a neat and leveled diagram of different types of shallow and deep foundations and describe them. Briefly.

b) A concrete column is reinforced with 4 bars of 20 mm dia. Determine the ultimate load carrying capacity of the column. Using M20 and Fe-415 steel, if the size of the column is 300 mm x 300 mm and 450 m x 450 mm, what will be the allowable service load in each case?

Q.7 Write short notes on any four:
   a) Column and strut
   b) Counterfort retaining wall
   c) Diagram showing forces on retaining wall
   d) Cantilever retaining wall
   e) Depth of footing by Rankine theory
End Semester Examination, May 2014
B. Tech. – Fourth Semester
DESIGN OF STEEL STRUCTURES-I (C-405)

Time: 3 hrs

Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is a structural design?
    b) Define rivet value.
    c) Draw any two rolled steel sections and name them.
    d) How will you find the net area for 2 ISA connected on either side of a gusset plate?
    e) Define lug angle.
    f) List the various types of column bases.
    g) Define a built-up column.
    h) Define column bases.
    i) List different types of sections used for steel beams.
    j) What is a gantry girder? 2x10

PART-A

Q.2 a) Draw the stress-strain curve for steel and discuss the properties of steel. 10
    b) What factors govern the size and cross-section of a rolled section? 10

Q.3 a) Discuss the relative advantages and disadvantages of riveted and welded connections. 10
    b) What are the various types of splices provided in tension members? Draw neat sketches. 10

Q.4 a) Draw a neat sketch of a slab base and define the various elements with their functions. 10
    b) Explain the steps for the design of a single lacing system for the built-up-column. 10

PART-B

Q.5 a) Explain briefly the general design criteria for beams. 10
    b) What do you understand by web buckling and web crippling? Explain. 10

Q.6 a) Draw a typical arrangement of gantry girder and crane girder and name each part. 10
    b) Explain stepwise the procedure for the design of a gantry girder. 10

Q.7 a) What is the necessity of stiffeners in a plate girder and how do you decide the type to be provided? 10
    b) Design the cross-section of a riveted plate girder of span 20 m to carry an u.d.l. of 45 kN/m excluding the self weight of the girder. Check it for bending stresses. 10
End Semester Examination, May 2014
B. Tech. – Fourth Semester
DESIGN OF STEEL STRUCTURES-I (C-405A)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Differentiate between fillet and butt welds.
b) Define rivet value and efficiency of joint.
c) Write any two advantages of bolted connections.
d) Define effective length and slenderness ratio.
e) How does one calculate the net sectional area in case of two angle section connected on the same side of gusset plate?
f) Write an expression to calculate the thickness of a slab base for a solid round column on a square plate.
g) Define web buckling.
h) What are the various elements of a plate girder?
i) What is the necessity of using various stiffeners in a plate girder?
j) Draw the section of a gantry girder.

2x10

PART-A

Q.2 a) Design and compare the efficiency of a single cover and double cover butt joint using rivets to connect two plates of thickness 14 mm. Assume $f_Y = 250 \text{ N/mm}^2$ and power driven rivets are used.
b) Write the advantages and disadvantages of welding.

10

Q.3 a) Design a single angle tie to carry a load of 47 kN. The tie is connected to a 12 mm thick gusset plate with a 24 mm dia. Power driven rivets are used and the length of the tie is 3 m between the intersections.
b) Write down the steps for designing the lacing for a built-up column.

10

Q.4 a) Write the steps for designing the gusseted base.
b) With the help of neat sketches draw the elevation, plan and side view of a slab base for a column.

10

PART-B

Q.5 a) Differentiate between laterally supported and unsupported beams. Write down steps for designing a laterally supported beam.
b) Design a simply supported beam of 6 m effective span carrying a concentrated load of 150 kN at mid span. Assume the beam is equal flanged and $f_Y = 250 \text{ N/mm}^2$.

10

Q.6 a) Calculate only the maximum bending moment due to moving wheel load on a gantry girder to be used in an industrial building carrying a travelling crane with the following data:

P. T. O.
i) Crane capacity = 200 kN
ii) Self weight of crane girder excluding trolley = 200 kN
iii) Self weight of trolley, electric motor, hook etc = 40 kN
iv) Approx. minimum approach of the crane hook to gantry girder = 1.20 m
v) Wheel base = 3.5 m
vi) C/C distance between gantry rails = 16 m
vii) C/C distance between columns = 8 m
viii) Self weight of rail section = 300 N/m
ix) Yield stress of steel = 250 N/mm²

b) Write down briefly all the design steps for designing a gantry girder.

Q.7
a) Design and check the cross-section of a plate girder for a 20 m span which is to be provided in a hall of restaurant. The superimposed load exclusive of self weight is 100 kN/m.

b) Write short notes on any two:
   i) Curtailment of flange plates
   ii) Intermediate stiffeners
   iii) Flange angle splices.
End Semester Examination, May 2014  
B. Tech. – Fourth Semester  
SOIL MECHANICS (C-406)

Time: 3 hrs  
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is the three phase diagram?  
b) Differentiate between dry density and bulk density.  
c) The maximum size of silt particle is __________.  
d) List various laboratory methods for determination of coefficient of permeability.  
e) What are limitations of Darcy’s law?  
f) Define quick sand condition.  
g) Name the factors on which compaction of soil depends.  
h) What do you understand by geostatic stresses?  
i) Define coefficient of consolidation.  
j) Write Mohr-Coulomb equation.  

2x10

PART-A

Q.2  
a) What do you understand by consistency of a soil? How is it determined?  
b) Develop the relationship between the void ratio, water content, specific gravity of particles and the degree of saturation.  

10  
10

Q.3  
a) List different classifications of soil and describe classification of soil based on grain size distribution.  
b) What is permeability? State the factors on which the permeability of a soil depends.  

10  
10

Q.4  
a) What is a compaction curve? Give its salient features. What is zero air void line?  
b) Differentiate between intergranular stress, pore water pressure and total stress. Also mention their importance in geotechnical engineering.  

10  
10

PART-B

Q.5  
a) Explain Westergaard’s theory for the determination of the vertical stress at a point. How is it different from Boussinesq’s solution?  
b) Write short notes on: 
i) Newmark’s influence chart.  
ii) Approximate stress distribution method for loaded areas.  

10  
5x2

Q.6  
a) Explain any one method of determining preconsolidation pressure.  
b) In a consolidation test void ratio decreased from 0.70 to 0.65 when the load was changed from 50 kN/m$^2$ to 100 kN/m$^2$. Compute compression index and coefficient of volume change.  

10  
10

Q.7  
a) On which types of soils unconfined compression test is conducted. Explain with the help of Mohr circles how shear strength parameters are determined in this type of test.  
b) What are different types of earth pressure? Explain with examples.  
c) What are assumptions of Rankine’s theory?  

10  
5  
5
End Semester Examination, May 2014
B. Tech. – Fourth Semester
ENGINEERING GEOLOGY (C-407)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on:
a) Geology.
b) Fault.
c) Minerals.
d) Folds.
e) Hydraulic gradient.
f) Geological time scale.
g) Soil profile.
h) Aquifer.
i) Oasis.
j) Stratification.

PART A

Q.2 a) Write a critical essay on the "Role of geological investigations in engineering practice".
   b) Describe briefly the internal structure of earth with a neat sketch.

Q.3 a) Write an essay on "Weathering of rock and factors affecting weathering".
   b) Explain different types of earthquake waves and what is Richter scale?

Q.4 a) Write short notes on minerals formed due to:
   i) Recrystallisation.
   ii) Rock forming minerals.
   b) What are the aims and principles of stratigraphy?

PART B

Q.5 a) Classify folds? Explain with the help of neat sketches, important types of folds as distinguished on the basis of inclination of axial planes.
   b) Write a brief note on "Joints in rocks and their effects on the engineering quality of rocks".

Q.6 a) Give the uses of remote sensing techniques for geological and hydrological survey and investigation.
   b) Explain the process of artificial recharge of ground water.

Q.7 a) What is a tunnel? What are the various parameters for site selection of a tunnel?
   b) Define:
      i) Abutments and reservoirs.
      ii) Highways and bridges.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
FLUID MECHANICS (C-408)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Define the following terms:
  a) Stream line streak lines.
  b) Viscosity of fluid.
  c) Gauge pressure and absolute pressure.
  d) Metacentric height.
  e) Boundary layer.
  f) Factors affecting head losses in pipe lines.
  g) Type of slopes in open channel flow.
  h) Assumption of gradually-varied flow.
  i) Local and average friction coefficient.
  j) Cavitation in turbines.

  2x10

PART-A

Q.2 a) Determine the minimum size of glass tube for the capillary rise in it not to exceed 0.2 mm of water. The surface tension of water in contact with air is 0.0725 N/m and contact angle 60°. 10
   b) State the Newton's law of viscosity. Sketch the Newton's law relationship for Newtonian and Non-Newtonian fluids. Give example for each fluid. 10

Q.3 a) Derive the Bernoulli's energy equation from the Euler's motion equation, mentioning clearly the assumptions made in the derivation. 10
   b) A venturi meter 150 mm x 75 mm is installed in a horizontal pipe line of 150 mm diameter carrying oil (s=0.9). The mercury level difference in U-tube manometer connected to inlet and throat is 175 mm. If C_v=0.97, find the rate of flow through pipe. 10

Q.4 a) Derive the Darcy-Weisbach equation for head loss due to friction in a pipe. 10
   b) A pipeline 0.225 m in diameter and 1580 long has a slope of 1:200 for the first 790 m. 1:100 for the next 790 m. The pressure at the upper end of the pipeline is 107.91 kPa and at the lower end is 53.955 kPa. Taking F=0.032, determine discharge through pipe. 10

PART-B

Q.5 a) Show that for a trapezoidal channel of given area of flow, the condition of maximum flow requires that hydraulic mean depth is equal to one half the depth of flow. 10
   b) A rectangular channel 7.5 m wide has a uniform depth of flow of 2.0 m and bed slope of 1:3000. If due to weir constructed at D/S, water surface at a section is raised by 0.75 m, determine the water surface slope with respect to horizontal at this section. Assume n=0.02 10

P.T.O.
Q.6  
a) Discuss about the model laws in detail.

b) The equation for specific speed for a turbine is given by \( N_s = \frac{N\sqrt{P}}{H^{\frac{3}{4}}} \).

By \( \pi \)-theorem and using variables such as power \( P \), speed \( N \), head \( H \), diameter \( D \), density \( \rho \) of the fluid, and acceleration \( g \), deduce the above expression for \( N_s \).

Q.7  

a) Discuss about head and efficiencies of hydraulic turbines in detail.

b) A centrifugal pump has an impeller 0.5 m outer diameter and when running at 600 rpm discharges water at the rate of 8000 l/min, against a head of 8.5 m. The water enters the impeller without whirl and shock. The inner diameter is 0.25 m and the vanes are set back at outlet at an angle of 45° and the area of flow from inlet to outlet of impeller is 0.06 m².

Determine:

i) The manometric efficiency of the pump.

ii) The vane angle at inlet.

iii) The least speed at which the pump commences to work.
End Semester Examination, May 2014
B. Tech. – Fourth Semester (CSE)/Eighth Semester (ECE)
COMPUTER NETWORKS (CS-401)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions
drom Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Name the layers on which following network devices work:
   Bridge, Router, Gateways, Hubs
   b) List briefly the difference between TCP/IP and OSI model.
   c) What are the four levels of addresses used in internet employing layered protocol?
   d) State VOIP.
   e) Briefly discuss the transport layer protocols. 4x5

   **PART-A**

Q.2  a) Explain all the modulation techniques that are considered as the foundation of
counter networks. 12
   b) State briefly medium of transmission for data in networks. 8

Q.3  a) Discuss IEEE 802.15 in detail. 12
   b) List briefly all the significance of layered protocol architecture. Discuss TCP/IP
   briefly. 8

Q.4  a) State the overview and standards of frame relay technology. 8
   b) Explain in detail WAN technologies. 12

   **PART-B**

Q.5  a) Differentiate IPv4 and IPv6. 8
   b) Describe all the IP routing protocols briefly. 12

Q.6  a) What are the various application layer protocols? State HTTP briefly. 15
   b) Throw some light on the concept of MIME. 5

Q.7  Write short notes on any four:
   a) Data encryption and cryptography techniques
   b) FTP and TFTP
   c) MAC layer
   d) TCP Vs UDP
   e) ISDN 5x4
End Semester Examination, May 2014
B. Tech. – Fourth Semester
COMPUTER NETWORKS (CS-401A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on:
   a) Data transmission media
   b) Fast Ethernet
   c) SONET/SDH
   d) ISDN
   e) IPv6
   f) VoIP
   g) V-LAN
   h) IMAP
   i) UDP
   j) Frame Relay

2x10

PART-A

Q.2 a) What do you understand by OSI reference model? Compare twisted pair cable and coaxial cable based on characteristics for data communication network. 10
   b) Distinguish between hubs, switches, repeaters, bridges, routers and gateways. 10

Q.3 a) What are the problems associated with 10GB Ethernet? Discuss in detail. 10
   b) Compare the wireless LAN and Bluetooth layer protocol architecture and discuss security issues in both standards. 10

Q.4 a) What do you understand by WAN? Explain the ATM layer architecture. 10
   b) Describe the importance of frame relay in wide area networks. 10

PART-B

Q.5 a) Compare ARP, RARP, ICMP and IGMP. 10
   b) What are problems/demerits associated with RIP and BGP? 10

Q.6 a) What do you understand by MIME? Explain the inefficiency or demerits of TFTP in detail. 10
   b) Explain the importance of HTTP in communication network. Compare IMAP and SNMP in detail. 10

Q.7 a) What do you understand by IPSec? Explain V-LAN architecture in detail. 10
   b) What do you understand by SNMP? Compare any two different types of firewalls. 10
End Semester Examination, May 2014
B. Tech. – Fourth Semester
ANALYSIS AND DESIGN OF ALGORITHMS (CS-402)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are the properties of Big-oh notation?
b) Solve the following recurrence relation
   \[ T(n) = 2T\left(\frac{n}{2}\right) + n^2 \]
c) Define feasible solution and optimal solution with examples.
d) What are characteristics of Greedy method?
e) What is the difference between 0/1 Knapsack problem and fractional Knapsack problem?
f) What do you mean by spurious hits in Rabin-Karp string matcher?
g) State Merge sort algorithm. Give its best case time complexity.
h) What do you mean be backtracking.
i) Differentiate between Prime’s algorithm and Kruskal’s algorithm.
j) What is a spanning tree? Explain with an example.

PART-A

Q.2 a) What are asymptotic notations? Explain different types of asymptotic notations with suitable examples.
b) Write the recursive algorithm for finding Fibonacci series. Calculate its time and space complexity.
c) Compare and contrast the complexities of atleast 5 sorting algorithms in best, worst and average cases.

Q.3 a) What is Naive string matching algorithm? Discuss the time complexity of Naive string matcher. Show the comparisons the Naive string matcher makes for the pattern P=0001 in the text T=00001 0001 01 0001.
b) What do you mean be string matching algorithm with finite automata? Draw a state transition diagram for a string matching automation for the pattern abababababababab over alphabet \(\sum\{a, b\}\).

Q.4 a) Write an algorithm for quicksort. Discuss best-case and worst-case running time. Arrange the following numbers in increasing order using quicksort (17, 28, 67, 31, 42, 36, 86, 23, 46, 49).
b) Find the maximum and minimum number in the following set of elements using recursive algorithm: \(\{22, 13, -5, -9, 15, 60, 17, 31, 47\}\)
c) Show that \(\frac{3n}{2} - 2\) comparisons are necessary to find both the maximum and minimum of \(n\) numbers.

PART-B

Q.5 a) Discuss job sequencing problem with deadlines with the help of a suitable example.

P. T. O.
b) Find the minimum spanning tree of the following connected graph using Kruskal’s algorithm.

Q.6  a) Explain the concept of optimal binary search tree with a suitable example. Also discuss its applications.  
     b) Explain dynamic programming approach. Discuss the advantages of dynamic programming technique.  
     c) State longest common subsequence problem. Give a suitable example.

Q.7  a) Write an algorithm for N-queens problem using backtracking approach and trace it for n=4. Also analyze its time complexity.  
     b) Write short notes on:  
        i) NP-hard problems  
        ii) NP-Complete problems.
End Semester Examination, May 2014  
B. Tech. – Fourth Semester  
PRINCIPLES OF OPERATING SYSTEMS (CS-403)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory.** Attempt any **TWO** questions from Part A and **TWO** questions from Part B. Each question carries equal marks.

Q.1  
a) List goals of an operating system. 
b) Differentiate between multitasking and multiprogramming.  
c) Define message queues. 
d) Differentiate between user level and kernel level threads.  
e) Differentiate between long term and short term schedulers. 
f) Define race condition by taking an example.  
g) Differentiate between seek time and latency time. 
h) List various attributes associated with a file.  
i) Define Belady’s anomaly.  
j) Differentiate between physical and logical memory addresses.  

**PART-A**

Q.2  
a) Explain various functions of a general purpose operating system.  
b) Explain micro kernel based architecture of an operating system.  
c) Explain basic concept of batch operating systems.  

Q.3  
a) Define Resource Allocation Graph. How is it useful in detection of deadlocks? Illustrate with the help of an example.  
b) Describe SJF scheduling algorithm by taking processes (p1, p2, p3, and p4) having CPU burst time (12, 10, 5, 2) and their arrival time (0, 2, 4, 5). Draw Gantt chart and also find average waiting time and turnaround time for each process.  

Q.4  
a) Explain solution of producer consumer problem using semaphores.  
b) Differentiate between internal and external memory fragmentation.  
c) Explain first-fit, best-fit and worst-fit approaches for contiguous memory allocation techniques by taking suitable examples.  

**PART-B**

Q.5  
a) Define a file. Explain various file access methods.  
b) Explain contiguous file allocation method by taking suitable example.  
c) Define directory structure. Explain various methods for implementing directory structures.  

Q.6  
a) Give general structure of an I/O sub system.  
b) Write the steps of transforming an I/O request to hardware.  
c) Explain FCFS disk scheduling algorithm. Find total head movements by taking the following queue (82, 175, 26, 153, 36, 130, 65, 72, 15) if R/W head starts at cylinder 45.  

Q.7  
a) Explain layered architecture of Linux operating system.  
b) Explain general architecture of Windows operating system.  
c) List various design principles of Linux operating system.
End Semester Examination, May 2014  
B. Tech. – Fourth Semester  
PRINCIPLES OF OPERATING SYSTEMS (CS-403A)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.  

Q.1  
(a) Define named pipes.  
(b) Define an operating system.  
(c) Differentiate between multiprocessing and multiprogramming.  
(d) Differentiate between process and thread.  
(e) What is IPC? List various IPC mechanisms.  
(f) Define critical section. What is its role in process synchronization?  
(g) Define directory structure. List various methods for implementing directory structure.  
(h) Explain functions of a device driver.  
(i) Define thrashing.  
(j) What information is present in segment table base register and segment table limit register?  

2x10  

PART-A  

Q.2  
(a) Discuss various services offered by an operating system.  
(b) Explain architecture of monolithic kernel based architecture of an operating system.  
(c) Explain purpose of a system calls by taking appropriate example.  

8  

Q.3  
(a) Define a process. Explain the process of context switch with the help of a diagram.  
(b) Describe RR scheduling algorithm. Find average waiting time and turn-around time by taking processes (p1, p2, p3, and p4) having CPU burst time (16, 24, 10, 18, 5, 2) with time quantum 4. Also draw Gantt chart.  

8  

Q.4  
(a) What are the essential properties of critical section problem? Illustrate with the help of an example.  
(b) List and explain necessary conditions of deadlock.  
(c) Explain Banker’s algorithm for deadlock avoidance by taking a suitable example.  

6  

12  

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PART-B  

Q.5  
(a) Explain the basic principal of paging in memory management.  
(b) Explain working of segmentation technique by taking a suitable example.  
(c) Explain steps of a basic page replacement technique.  

4  

10  

6  

Q.6  
(a) Explain Linked allocation method by taking appropriate example.  
(b) Find total head movements for FCFS, SSTF, SCAN, C-SCAN and LOOK disk scheduling algorithms. The total number of cylinders in the disk are 200 numbered from 0-199. The current position of the head is 100 and the service queue is (140, 180, 195, 55, 105, 50).  

5  

15  

Q.7  
(a) Explain general architecture of Linux operating system.  
(b) Explain user mode and kernel mode process in windows operating system.  
(c) Explain life cycle of an I/O request.  

8  

8  

4
End Semester Examination, May 2014
B. Tech. – Fourth Semester
THEORY OF AUTOMATA AND COMPUTATION (CS-404)

Time: 3 hrs

Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Explain the block diagram of finite automation in detail.
b) Show that $S \rightarrow aAS \mid a, A \rightarrow SbA \mid ba \mid SS$ is ambiguous.
c) Explain the model of linear bounded automata.
d) Let $G = (\{S, C\}, \{a, b\}, P, S)$ where $P$ consists of $S \rightarrow aCa, C \rightarrow aCa \mid b$. Find $L(G)$.
e) State and prove Halting problem of turing machine.

PART-A

Q.2
a) State and prove Arden's theorem.
b) Construct finite automata equivalent to the regular expression $(a+b)^* (aa+b)(a+b)^*$
c) Find the regular expression corresponding to following finite automata

![Finite Automata Diagram]

Q.3
a) Explain tuples of Mealy and Moore machines. How Mealy machine is different from Moore machine. Construct Moore machine equivalent to the Mealy machine defined by table:

<table>
<thead>
<tr>
<th>Present State</th>
<th>a = 0 State</th>
<th>a = 1 State</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>O/P</td>
<td></td>
</tr>
<tr>
<td>$q_0$</td>
<td>$q_1$</td>
<td>$q_2$</td>
</tr>
<tr>
<td>$q_1$</td>
<td>$q_4$</td>
<td>$q_4$</td>
</tr>
<tr>
<td>$q_2$</td>
<td>$q_2$</td>
<td>$q_3$</td>
</tr>
<tr>
<td>$q_3$</td>
<td>$q_5$</td>
<td>$q_1$</td>
</tr>
<tr>
<td>$q_4$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) Find a deterministic acceptor equivalent to $M = (\{q_0, q_1, q_2, q_3\}, \{0, 1\}, \delta, q_0, \{q_3\})$ Where $\delta$ is given by:

<table>
<thead>
<tr>
<th>State/ $\Sigma$</th>
<th>Input = $a$</th>
<th>Input = $b$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$q_0$</td>
<td>$q_0, q_1$</td>
<td>$q_0$</td>
</tr>
<tr>
<td>$q_1$</td>
<td>$q_2$</td>
<td>$q_1$</td>
</tr>
<tr>
<td>$q_2$</td>
<td>$q_3$</td>
<td>$q_2$</td>
</tr>
<tr>
<td>$q_3$</td>
<td>-</td>
<td>$q_3$</td>
</tr>
</tbody>
</table>

P. T. O.
Q.4  
   a) Construct minimum state automaton equivalent to the finite automaton described by table given below:

<table>
<thead>
<tr>
<th>State/Σ</th>
<th>1/P=0</th>
<th>1/P=1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>→ q₀</td>
<td>q₁</td>
<td>q₅</td>
</tr>
<tr>
<td>q₁</td>
<td>q₆</td>
<td>q₂</td>
</tr>
<tr>
<td>q₂</td>
<td>q₀</td>
<td>q₂</td>
</tr>
<tr>
<td>q₃</td>
<td>q₄</td>
<td>q₆</td>
</tr>
<tr>
<td>q₄</td>
<td>q₇</td>
<td>q₅</td>
</tr>
<tr>
<td>q₅</td>
<td>q₂</td>
<td>q₆</td>
</tr>
<tr>
<td>q₆</td>
<td>q₆</td>
<td>q₂</td>
</tr>
<tr>
<td>q₇</td>
<td>q₆</td>
<td>q₂</td>
</tr>
</tbody>
</table>

   b) State and prove pumping Lemma for regular sets. Also, show that \( L = \{a^i | i \geq 1\} \) is not regular.

   PART-B

Q.5  
   a) Explain Chomsky hierarchies of grammars.
   b) Reduce the following CFG to CNF.
      \[ S \rightarrow ABb | a \]
      \[ A \rightarrow aaA \]
      \[ B \rightarrow bAb \]
   c) Construct reduced grammar equivalent to the grammar
      \[ S \rightarrow aXa \]
      \[ X \rightarrow Sb | bYy | DaX \]
      \[ Y \rightarrow ab | DD, Z \rightarrow aY \]
      \[ D \rightarrow aDX \]

Q.6  
   a) Convert the grammar \( S \rightarrow aSb | A, A \rightarrow bSa | S^* \) to a PDA that accepts the same language by empty stack.
   b) Write applications of pushdown machines.
   c) Construct a deterministic PDA accepting \( L = \{w \in \{a,b\}^* | \text{number of a's in } w \text{ equals to the number of b's in } w\} \) by final state.

Q.7  
   a) Show that \( f(x,y) = x^y \) is a primitive recursive functions.
   b) Describe a turing machine \( M \) to recognize the language \( L = \{1^n, 2^n, 3^n | n \geq 1\} \).
   c) Explain the problem of decidability and undecidability with examples.
End Semester Examination, May 2014  
B. Tech. – Fourth Semester  
THEORY OF AUTOMATA AND COMPUTATION (CS-404A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Explain the block diagram of finite automata.  
b) Show that the grammar $S \rightarrow aB \mid ab$, $A \rightarrow aAB \mid a$, $B \rightarrow ABb \mid b$ is ambiguous.  
c) State and prove Arden’s theorem.  
d) Write the applications of pushdown machines.  
e) State post correspondence problem with example.  

**PART-A**  

Q.2  
a) Minimize the following automata shown in the figure:

![Automata Diagram](image)

b) Construct a Mealy machine equivalent to Moorey machine defined by:

<table>
<thead>
<tr>
<th>Present State</th>
<th>$a = 0$</th>
<th>$a = 1$</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rightarrow q_0$</td>
<td>$q_1$</td>
<td>$q_2$</td>
<td>1</td>
</tr>
<tr>
<td>$q_1$</td>
<td>$q_3$</td>
<td>$q_2$</td>
<td>0</td>
</tr>
<tr>
<td>$q_2$</td>
<td>$q_2$</td>
<td>$q_1$</td>
<td>1</td>
</tr>
<tr>
<td>$q_3$</td>
<td>$q_0$</td>
<td>$q_3$</td>
<td>1</td>
</tr>
</tbody>
</table>

c) Remove the $\rightarrow$-move and construct a DFA equivalent to given NDFA:

![DFA Diagram](image)

P. T. O.
Q.3
a) Write the Chomsky classification of grammar.

b) Construct a grammar generating the set of all palindromes over \{a, b\}.

c) Find the languages generated by following grammar:
   i) \( G = (\{S, C\}, \{a, b\}, P, S) \) where \( P \) consists of \( S \rightarrow aCa, C \rightarrow aCa | b \)
   ii) \( G = (\{S\}, \{a, b\}, P, S) \) where \( P \) consists of \( S \rightarrow aS | bS | a | b \).

Q.4
a) Construct an FA with reduced states equivalent to the regular expression:
   \( 10 + (0+1)^*1 \)

b) Find the regular expression corresponding to the following automata shown in the figure:

\[
\begin{array}{c}
1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow 6 \rightarrow 7 \rightarrow 2 \rightarrow 1
\end{array}
\]

c) Show that \( \{p^p \mid p \text{ is a prime} \} \) is not regular.

\textbf{PART-B}

Q.5
a) Find a reduced grammar equivalent to grammar whose productions are:
   \( S \rightarrow AB \mid CA, B \rightarrow BC \mid AB, A \rightarrow a, C \rightarrow aB \mid b \)

b) Convert the grammar \( S \rightarrow AB, A \rightarrow BS \mid b, B \rightarrow SA \mid a \) into GNF.

Q.6
a) Construct a PDA accepting \( \{a^n b^{2n} \mid n \geq 1 \} \) by null store.

b) Explain push down automata with an example.

c) Construct the equivalent PDA for the following CFG,
   \( S \rightarrow AbA \mid bA, A \rightarrow B \mid S, B \rightarrow C \)

Q.7
a) Design a TM for the language \( L = \{a^{2n} \mid n \geq 0 \} \)

b) Show that the function \( f(x, y) = x + y \) is primitive recursive.

c) Explain the properties of recursively enumerable languages.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
CYBER SECURITY (CS-405)

Time: 2 hrs
Max Marks: 50
No. of pages: 1

Note: Attempt FIVE questions in all. Each question carries equal marks.

Q.1 a) Explain in detail the general architecture of internet. 5
   b) What are the various classes of IP addressing? Change the following addresses
ten dotted-decimal notation to binary notation.
      111.56.45.78
      221.34.7.82
15

Q.2 a) What do you understand by threat on information? 2
   b) Explain malware and web attacks. 8

Q.3 a) What are the various categories of internet frauds? 3
   b) Explain the investment offer attacks and list down the guidelines to protect against
them. 7

Q.4 a) Explain the passive scanning techniques. 5
    b) What do you understand by SQL script injection? Explain. 5

Q.5 Explain the general guidelines which should be followed in any forensic examination. 10

Q.6 Why is it necessary to have a legal protection from cyber crimes? Explain. 10

Q.7 a) Define network. Explain the following:
      i) LAN    ii) MAN    iii) WAN 10

Q.8 Explain the following terms:
   i) Phishing
   ii) Cyber stalking 5x2
End Semester Examination, May 2014  
B. Tech. (ECE/EEE) – Fourth Semester  
ELECTROMAGNETIC FIELD AND WAVES (EC-304A)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define voltage standing wave ratio for a transmission line.  
b) Write Maxwell’s equations in their general differential form.  
c) Explain Biot-Savart’s law.  
d) What do you understand by electric field intensity?  
e) Find the velocity of plane wave in a lossless medium having a relative permittivity of 5 and relative permeability of unity.  
f) Define characteristic impedance of a transmission line.  
g) Determine the curl of \( \mathbf{A} = (2x^2 + y) \hat{x} + (3y - y') \hat{y} \).  
h) Briefly explain Faraday’s law of electromagnetic induction.  
i) What is magnetic vector potential?  
j) Write a short note on Smith chart.  

2x10

PART-A

Q.2  
a) Transform vector \( \mathbf{A} = 5r\hat{r} + 2\sin \theta \hat{\theta} + 2\cos \theta \hat{\phi} \) in spherical to Cartesian co-ordinates.  
b) Explain divergence theorem in detail.  

10

Q.3  
a) Deduce an expression for the energy stored in an electric field having point charges.  
b) State and proves uniqueness theorem.  
c) Show that the electric field intensity is equal to the negative gradient of the potential.  

6  
10  
4

Q.4  
a) Derive an expression for the magnetic field at the axis of a current carrying circular loop of radius \( R \). What is the direction of the field?  
b) Discuss boundary relations for magnetic fields.  

12  
8

PART-B

Q.5  
a) What is the significance of Poynting vector?  
b) Write a note on the consistency of Ampere’s law.  
c) Find the displacement current density next to your radio, in air, where the local FM station provides a carrier having \( \mathbf{H} = 0.2 \cos(2.10(3 \times 10^4 t - x))\hat{z} \text{ (A/m)} \).  

5  
8  
7

Q.6  
a) Using Maxwell’s equations derives the wave equation for \( \mathbf{E} \) and \( \mathbf{H} \) in free space.  
b) What do you understand by surface impedance?  
c) Write a short note on polarization of electromagnetic waves.  

10  
5  
5

Q.7  
a) Derive expressions for the attenuation and phase shift constant of the transmission line in terms of the primary constants of the line.  
b) A lossless transmission line has an inductance of 1.2 mH/km and a capacitance of 0.05 \( \mu \)F/km. Calculate the characteristic impedance of the line.  
c) Obtain a relationship between VSWR and reflection coefficient of a transmission line.  

10  
6  
4
End Semester Examination, May 2014
B. Tech. - Fourth Semester
MICROPROCESSORS AND INTERFACING (EC-401 / EC-401A)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer any ten:
a) What are the functions of ALE and ready signals in 8085?
b) What is the difference between direct and indirect addressing modes of 8085?
c) What will be the status of carry flag and accumulator after execution of following sequence of instructions?
   STC
   MVI A, 88H
   RLC
d) Explain the function of BHE and LOCK signal of 8086.
e) Assume (CL) =03H, (AX) =0846H. Determine the new contents of AX and carry flag after execution of SAR AX, CL.
f) What will be the address of top of stack if current values of CS, SS and SP are 1440H, 0800H, and EE00H, respectively?
g) How many address lines are required to access 4K memory locations?
h) Write control word for 8255 for BSR mode to reset bits PC0, PC2 and PC5.
i) What do you understand by the term: pipelining?
j) Explain the format of control word register of 8259.
k) Explain any two modes of operations of 8253.
l) What are the functions of following registers of DMA controller 8237?
   -Command Register
   -Mask Register

2x10

PART-A

Q.2 a) State the function performed and addressing mode used for the following instructions of 8085:
i) DAD D
   ii) JNC 2090
   iii) RST 5
   iv) SHLD 1550H
b) Describe the interrupt signals of 8085 with their important features and call location / addresses.

3x4

Q.3 a) Explain the functions of segment register and instruction pointer of 8086 in detail.

5

b) What are the functions of following signals in 8086?
   LOCK, TEST, QS1-QS0, NMI, BHE

2x5

c) How data is transferred from the low and high banks of the memory in 8086? Explain.

5

Q.4 a) Explain direct addressing, indirect addressing and register relative addressing modes of 8086 by giving suitable examples.

3x3

b) Describe the functions performed by the following instructions of 8056:
i) AAA
   ii) STD
   iii) RCL AX, CL

6

c) Write any four assemblers directives used for 8086 and explain their functions.

5

P. T. O.
PART-B

Q.5 a) What are the basic general requirements for interfacing memory with microprocessor? Draw the generalized block diagram of internal structure of RAM. Illustrate its interfacing with a microprocessor. Explain the purpose of each and every signal used therein for interfacing. 10
   b) Compare memory mapped I/O and peripheral mapped I/O address schemes. 4
   c) How can PLDs be used for memory address decoding? Explain. 6

Q.6 a) Explain the programmed I/O data transfer scheme used for transferring the data between I/O device and microprocessors. 4
   b) Draw the functional block diagram of PPI 8255 and explain the function of its each block. 10
   c) Illustrate the control word format and control signals of PPI 8255 for its mode 2 operation with port A as bidirectional and port B in mode 1. 6

Q.7 a) Explain 'programmable one shot' and 'rate generator' modes of 8253. 6
   b) Describe the different interrupt modes of PIC 8259. 8
   c) What are functions of following signals in DMAC 8237? ADSTB, AEN, HRQ, EOP 6
End Semester Examination, May 2014
B. Tech. – Fourth Semester
COMMUNICATION SYSTEMS (EC-402)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all: Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is the difference between power signal and energy signal?

b) What is the advantage of vestigial side band over SSB system?

c) Draw the block diagram for generation of PM signal using FM modulator.

d) A 400 W carrier is modulated to a depth of 75 percent. Find the total power in the AM wave. Assume that the modulating signal is sinusoidal.

e) Given an angle-modulated signal:
   \[ x(t) = 10 \cos[10^5 \pi t + 5 \sin 2\pi (10^3) t] \]
   Determine the maximum frequency deviation.

f) What is the difference between low level and high level modulation?

g) An amplifier operating over the frequency range of 18 to 20 MHz has a 10 kΩ input resistor. What is the r.m.s. noise voltage at the input to this amplifier if the ambient temperature is 27°C?

h) What are the advantages of using a RF amplifier in AM receiver?

i) What is the need of preemphasis and deemphasis in FM?

j) Write the characteristics of an FM receiver.

2x10

PART-A

Q.2
a) What is modulation? Why is it required?

b) Find Fourier series expansion of the given signal:

\[ X(t) = \begin{cases} A & -T < t < 0 \\ 0 & 0 < t < T \\ -A & T < t < 2T \\ \end{cases} \]

\[ t \]

c) State and prove time scaling property of Fourier transform.

Q.3
a) Define the term: noise. Explain different types of external noise.

b) What is system noise temperature? How is it related to noise figure? An antenna has a noise temperature of 40 K and is matched into a receiver which has a noise temperature of 100 K. Calculate the noise power for a bandwidth of 36 MHz.

Q.4

b) Discuss synchronous demodulation method used for DSB waves. Evaluate the effect of phase error in the local oscillator on synchronous DSB demodulation.

c) Explain frequency division multiplexing.

P. T. O.
Q.5  a) A carrier is frequency modulated with a sinusoidal signal of 2 kHz, resulting in a maximum frequency deviation of 5 kHz.
   i) Find the bandwidth of the modulated signal.
   ii) The amplitude of the modulating sinusoid is increased by a factor of 3, and its frequency is lowered to 1 kHz. Find the maximum frequency deviation and the bandwidth of the new modulated signal.
   b) Explain indirect method for FM generation with a suitable block diagram.
   c) Explain the operation of a ratio detector.

Q.6  a) Explain the following terms with reference to radio receivers:
   i) Sensitivity
   ii) Selectivity
   iii) Image frequency rejection.
   b) What do you mean by automatic gain control (AGC)? What are the merits of delayed AGC over simple AGC?
   c) Compare and contrast tuned radio frequency (TRF) receiver with a superheterodyne receiver.

Q.7  a) What is meant by threshold in FM detector?
   b) Calculate the figure of merit, Y for a DSB-SC system.
   c) Prove that narrowband FM offers no improvement in SNR over amplitude modulation.
End Semester Examination, May 2014  
B. Tech. – Fourth Semester  
ANALOG ELECTRONIC CIRCUITS (EC-403)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define CMRR and slew rate for an operational amplifier.  
b) Why open-loop configuration of op-amp is not suitable for linear application?  
c) Draw voltage to current converter.  
d) What is a voltage follower?  
e) Explain the working principle of OTA.  
f) Find the value of $V_o$ from the given diagram:  

![Diagram](image)  
g) Sketch typical input and output characteristics for an inverting Schmitt trigger.  
h) What is a peak detector?  
i) What output is achieved when a square wave is given to the input of a differentiator?  
j) What is a filter? Define frequency response of it.  

PART-A  

Q.2  
a) List the ideal characteristics of an operational amplifier and explain its working with the help of a block diagram.  
b) Derive the expression for $A_v$, $A_c$, $R_i$ and $R_o$ of dual input balanced output differential amplifier.  

Q.3  
a) Explain the working of an op-amp as voltage controlled voltage source and current controlled current source.  
b) How the operational amplifier works as an?  
i) Integrator  
ii) Differentiator  

Q.4  
a) What are precision circuits? Explain the working of precision rectifiers.  
b) Discuss the operation of a basic comparator circuit. List the important characteristics and limitation of an op-amp as a comparator. Draw its input and output waveforms.  

PART-B  

Q.5  
a) What is the difference between active and passive filters? Explain the working of Sallen key filter (unity gain).  
b) What is the need of higher order filters? Calculate the transfer function of 2nd order high pass Butterworth filter.  

Q.6  
a) Draw the block diagram and pin configuration of 555 timers. List its modes of operation and explain any one mode of operation.  
b) Explain the working of twin T-oscillator.  

Q.7  
a) Explain SMPS with the help of a neat circuit diagram.  
b) What is a voltage regulator? Explain IC voltage regulator. Design a $+9V$ voltage regulator using 7809 IC.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
POWER SYSTEM-I (EE-304A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Compare nuclear and hydroelectric power plants.
    b) Surge tank is provided for the protection of __________.
    c) A generating station has a connected load of 100 MW and maximum demand 80 MW. The units generated are 65 x 10^6 per annum. Calculate load factor.
    d) String efficiency for ΔC system is 100%. Discuss.
    e) Write full name of ACSR conductors.
    f) Why bundled conductors are used for overhead lines?
    g) What is Ferranti effect?
    h) What types of cables are used for underground lines?
    i) What are different types of earthing?
    j) In any transmission line AD-BC=? ________.

    2x10= __________.

PART-A

Q.2 a) Draw a schematic diagram of steam power plant and explain the function of each part.
    b) Compare different types of electricity generating plants.

10

Q.3 a) What do you understand by a load curve? What information is conveyed by a load curve?
    b) A generating station has a maximum demand of 25 MW, a load factor of 60 %, a plant capacity factor of 50 % and plant use factor of 72 %. Find:
       i) Reserve capacity of a plant.
       ii) Daily energy produced.
       iii) Maximum energy that could be produced daily if the plant while running as per schedule, were fully loaded.

10

Q.4 a) What is sag? Derive an expression to calculate sag when supports are at unequal level.
    b) What are factors which affect corona? Explain in detail.

15

PART-B

Q.5 Derive an expression for capacitance per phase of 3-phase transmission line when conductors are placed:
   a) Symmetrically.
   b) Unsymmetrically but transposed.

10x2

Q.6 Write short notes on:
   a) Ring main distributors.
   b) Current distribution in a 3-wire d.c. system.

10x2

Q.7 What is equipment grounding? Explain the types of neutral grounding.

20
End Semester Examination, May 2014
B. Tech. – Fourth Semester
ELECTRICAL MACHINES-II (EE-401 / EE-401A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is slip of a induction motor and how it is calculated?
b) Under what conditions a 3-phase induction motor has maximum efficiency?
c) Under what conditions the induction motor can be operated as a generator?
d) How many windings are there in the stator of 1-phase induction motor and how they are placed?
e) What is most commonly used 3-phase ac motor?
f) Define voltage regulation of an alternator and write expression for the same.
g) What happens to the terminal voltage of an alternator with increase in load?
h) State the arrangement to make three phase synchronous motor self starting and where it is provided.
i) Why large capacity alternators are having cylindrical rotor?
j) Draw the short circuit characteristics of an alternator.

PART-A

Q.2 a) Derive an expression for maximum torque and the condition for maximum torque.

PART-B

Q.3 a) State the various methods of starting large induction motors. Explain in detail the auto-transformer method of starting with a neat sketch and also give advantages and disadvantages of the same.
b) State the various methods of speed control of three-phase induction motors.

Q.4 a) Based on the double revolving field theory, justify why a single phase induction motor is not self-starting?
b) Draw the torque slip characteristics of 1-phase induction motor.
c) State the methods used for self-starting of 1-phase induction motor.

Q.5 a) Derive the emf equation of 3-phase alternator.
b) Explain synchronous impedance method of determining voltage regulation and state its limitations.
c) Explain the terms:
   i) Leakage reactance.
   ii) Synchronous impedance.

Q.6 a) Derive an expression for power developed in a 3-phase synchronous motor.
b) Explain the effect of load on synchronous motor with neat diagrams.

Q.7 a) State different types of permanent magnet brushless motors. Describe in detail the working principle and constructional features of these with neat diagrams.
b) Justify the need for parallel operation of alternators and state the conditions to be fulfilled for parallel operation of 3-phase alternators.
End Semester Examination, May 2014  
B. Tech. – Fourth Semester  
ELECTRONIC INSTRUMENTATION (EE-402)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is piezoelectric effect?  
b) Illustrate the advantages of LED over LCD.  
c) What is difference between primary and secondary transducers?  
d) What is the function of sample and hold circuit?  
e) Define resolution in ADC.  
f) What is the basic principle of operation of digital multimeter?  
g) What are various application of a CRO?  
h) Define Seeback effect.  
i) What is PLL?  
j) A thermistor has a resistance temperature coefficient of -5% over a temperature range of 25°F to 50°F. If the resistance of thermistor is 100 Ω at 25°F, what is the resistance at 35°F?  

PART-A

Q.2  
a) Explain the construction working principle of wire wound strain gauges and derive an expression for the gauge factor.  
10
b) Describe the method for measurement of temperature with use of:  
i) RTDs  
ii) Thermistors  
5x2

Q.3  
Explain the operation of cathode raytube and discuss the function of the following controls:  
a) Intensity  
b) Focus  
c) Horizontal and vertical deflecting systems.  
20

Q.4  
a) Describe the pulse generator with the help of a block diagram.  
10  
b) Explain wave analyzer with the help of a suitable block diagram.  
10

PART-B

Q.5  
a) Draw a block diagram of data acquisition system. Explain its various elements in detail.  
10  
b) What is analog multiplexing? Discuss its types in detail.  
10

Q.6  
a) Explain R-2R ladder digital to analog converter with a suitable diagram.  
10  
b) With the help of a proper diagram, explain successive approximation type analog to digital converter.  
10

Q.7  
a) Draw the circuit diagram for measurement of frequency and explain its working also.  
10  
b) Write short notes on:  
i) DCAs  
ii) Universal counter  
5x2
End Semester Examination, May 2014
B. Tech. – Fourth Semester
ELECTRONIC INSTRUMENTATION (EE-402A)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is the difference between a transducer and an inverse transducer?
    b) What is a load cell?
    c) What are Lissajous pattern?
    d) Define resolution and quantization error.
    e) What are types of sweeps?
    f) What type of electrodes are used in EEG?
    g) What do you mean by signal conditioning?
    h) What is the operation of current source in a pulse generator?
    i) Explain PLL.
    j) Explain decade counting assembly.

    PART-A

Q.2 a) Explain construction and working of LVDT.  
    b) What is a strain gauge? Derive an expression for gauge factor.  

Q.3 a) Draw and explain block diagram of ECG measurement. 
    b) Write a short note on instrumentation amplifier. 

Q.4 Draw a block diagram and explain various elements of CRO.  

    PART-B

Q.5 a) Draw a block diagram and explain working of a square wave pulse generator. 
    b) Explain spectrum analyser with a block diagram. 

Q.6 a) Explain with a block diagram data acquisition system. 
    b) Explain with a block diagram of AC signal conditioning system. 

Q.7 a) Draw and explain the block diagram from frequency measurement. 
    b) Explain the working and block diagram of a universal counter.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
ELECTRONIC INSTRUMENTATION (EE-402B)

Time: 3 hrs
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is the difference between a primary and a secondary transducer?
b) What type of transducer is used to measure force?
c) What are Lissajous patterns?
d) Define gauge factor and write down expression for gauge factor.
e) What are graticules?
f) What do you mean by signal conditioning?
g) Explain resolution and quantization error.
h) What is analog multiplexing?
i) What are the types of sweeps?
j) What types of electrodes are used in EMG?

2x10

PART-A

Q.2  a) Explain working, construction and characteristics of LVDT. What are its advantages and disadvantages?
b) With the help of a proper diagram, explain construction and working of piezoelectric transducer.

10
10

Q.3  a) Draw and explain a block diagram of ECG measurement.
b) Write a short note on instrumentation amplifier.

10
10

Q.4  Draw a block diagram of a CRO and explain its various elements.

20

PART-B

Q.5  a) Draw a block diagram and explain in detail the working of pulse generator.
b) Explain with a block diagram working of spectrum analyzer.

10
10

Q.6  a) What is data acquisition system? Draw and explain its block diagram.
b) What is PLL? Explain PLL IC 565 and its applications?

10
10

Q.7  a) Explain in detail working of frequency measurement. Support your answer with a block diagram.
b) What are the types of digital voltmeter? Explain working of ramp type digital voltmeter.

10
10
End Semester Examination, May 2014
B. Tech. – Fourth Semester
SWITCHGEAR AND PROTECTION (EE-403 / EE-403A)

Time: 3 hrs

Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
(a) What are the advantages of per unit computations?  
(b) What are symmetrical components?  
(c) Draw the single phase equivalent circuit of a 3-winding transformer.  
(d) Why faults occur in power system?  
(e) Define DC offset current.  
(f) Write boundary condition in LG fault.  
(g) What is back up protection?  
(h) What are different zeroes of protection?  
(i) What are switching surges?  
(j) Why is 3-'g symmetrical fault more severe than 3-'g unsymmetrical fault?  

2x10

PART-A

Q.2  
How transients occur on transmission lines and synchronous machines? Explain in detail.  

20

Q.3  
(a) Explain in detail unsymmetrical fault analysis.  
(b) In a 3-phase, 4 wire system, the current in R, Y and B lines under abnormal condition of loading are as under:  
\[ I_R = 100 \angle 30^\circ \text{A}, \quad I_Y = 50 \angle 300^\circ \text{A}, \quad I_B = 30 \angle 180^\circ \text{A} \]  
Calculate the positive, negative and zero sequence currents in R line and return current in neutral wire.  

10

Q.4  
(a) Explain problem of circuit interruption while using circuit breaker.  
(b) Explain in detail vacuum circuit breaker.  

10

PART-B

Q.5  
(a) Describe briefly some important types of electromagnetic attraction relays.  
(b) Define and explain following terms as applied to protective relaying:  
   i) Pick up value.  
   ii) Current setting.  
   iii) Plug setting multiplier.  
   iv) Time setting multiplier.  

10

Q.6  
(a) Explain construction and working of Bucholtz relay.  
(b) Describe the Merz price circulating current system for the protection of a transformer.  

10

Q.7  
Write short notes on:  
(a) Rod gap diverter.  
(b) Horn gap diverter.  
(c) Expulsion type diverter.  
(d) Multi gap diverter.  

5x4
End Semester Examination, May 2014
B. Tech. – Fourth Semester
PRINCIPLES OF COMMUNICATION (EE-404)

Time: 3 hrs Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain the difference between analog and digital signals.
b) What is a DSB-SC system? What are its advantages?
c) What is a transmitter? Draw a block diagram of an AM transmitter.
d) For a FM wave represented by voltage equation:
   \[ V_{fm}(t) = 10\sin(8 \times 10^6 t + 7\sin 6 \times 10^6 t) \]
   determine the carrier frequency, modulating frequency, modulation index and power dissipated in 8 Ω load.
e) Differentiate between phase and frequency modulations.
f) State sampling theorem. Find the Nyquist rate for the following signal:
   \[ x(t) = 5\cos(1000\pi t - \cos(4000\pi t + 3\sin(2000\pi t) \]
g) What is aliasing? How can it be avoided?
h) Explain direct sequence spread spectrum system.
i) Explain FSK modulation.
j) Calculate the rms noise voltage at the input of a video amplifier using a device having 500 Ω equivalent noise resistance and 400 Ω input resistor. The bandwidth of the amplifier is 7 MHz and the ambient temperature is 27° C.

PART-A

Q.2 a) What do you mean by the word communication in general? Draw the block diagram of a communication system and explain each block in detail. 10
b) Define a signal. Explain different types of signals giving examples of each. 10

Q.3 a) Explain with a neat circuit diagram the working of switching modulator. Obtain an expression for its output. 7
b) When the modulation percentage is 75, an AM transmitter produces 10 W. How much of this is carrier power? What would be the percentages power saving if the carrier and one of the sidebands were suppressed before transmission? 6
c) Describe with the help of a block diagram the working of a super heterodyne receiver. 7

Q.4 a) Discuss with a suitable block diagram indirect method for FM generation. 7
b) In a sinusoidal angle modulation, the modulated signal is given by \( x(t) = A\cos(\omega_c t + \beta\sin\omega_m t) \). Find the average power in an angle modulated signal. 6
c) Explain the working of phase discriminator circuit with the help of a block diagram and phasor diagrams. 7

PART-B

Q.5 a) What are various pulse modulation schemes? Explain and compare these schemes. 7
b) What is delta modulation? Discuss its advantages and disadvantages. 6

P. T. O.
c) 24 telephone channels, each band limited to 3.4 kHz, are to be time division multiplexed by using PCM. Calculate the bandwidth of the PCM system for 128 quantization levels and an 8 kHz sampling frequency.

Q.6  a) What is M-ary phase shift keying? Explain in detail QPSK modulator with a block diagram. Compare its bandwidth with BPSK scheme.
     b) What are the advantages of spread spectrum techniques? Also, give applications of spread spectrum system.

Q.7  a) Write short notes on:
     i) Shot noise.
     ii) Noise temperature.
     iii) Equivalent noise bandwidth.
     b) The noise figure of the individual stages of a two stage amplifier is 2.03 and 1.54, respectively. The available power gain of the first stage is 18 dB. Evaluate the overall noise figure.
End Semester Examination, May 2014
B. Tech. – Fourth / Fifth Semester
COMMUNICATION ENGINEERING-II (EC-505)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What are the advantages and disadvantages of digital communication?
b) Explain the difference between uniform and non uniform quantization.
c) Why is clock recovery required in a BPSK demodulator circuit?
d) Define cumulative distribution function (CDF). Write different properties of CDF.
e) What is meant by a matched filter?
f) Give the equation for average probability of error for baseband signal receiver.
g) Define information. One of four possible messages Q_1, Q_2, Q_3 and Q_4 having probabilities 1/8, 3/8, 3/8 and 1/8, respectively is transmitted. Calculate the average information per message.
h) Consider a channel with an input x and an output y. Show that if x and y are statistically independent, then H(x/y) = H(x) and I(x; y) = 0.
i) State central limit theorem.
j) What is autocorrelation function R_{xx}(r). Prove that |R_{xx}(r)| \leq R_{xx}(0).

PART-A

Q.2
a) What are different pulse modulation techniques? Explain how PPM signal is obtained from PWM signal?
b) Explain in detail – pulse code modulation (PCM). Derive the relation between SNR and number of bits in a PCM code.
c) Write short note on adaptive delta modulation.

Q.3
a) Explain QPSK modulator and demodulator. What is the bandwidth required to transmit QPSK signal?
b) What is Gaussian Minimum Shift Keying (GMSK) technique? What are its advantages over other digital modulation techniques?

Q.4
What is an optimum filter? Derive the expression for probability of error, P_e and transfer function, H(f) of optimum filter.

PART-B

Q.5
a) What is entropy? Consider a binary memoryless source x with two symbols x_1 and x_2. Show that entropy, \( H(x) \) is maximum when both \( x_1 \) and \( x_2 \) are equiprobable. Also find out the maximum value of \( H(x) \).
b) State and prove Shannon Hartley theorem. For a signal of bandwidth 3 kHz and SNR of 15:
   i) Calculate the channel capacity
   ii) If the bandwidth is increased to 4 kHz, and the signal is transmitted over the same channel, calculate the required SNR and percentage change in the signal power.
c) A source x has five equally likely symbols:
   i) Construct Shannon-Fano code for x, and calculate the efficiency of the code.
   ii) Repeat for the Huffman code and compare the results.

P. T. O.
Q.6  a) The joint pdf of $x$ and $y$ is given by $f_{xy}(x,y) = y e^{-x^2 - y^2/2} u(x) u(y)$:
   i) Find the marginal pdfs $f_x(x)$ and $f_y(y)$.
   ii) Are $x$ and $y$ independent? 6

   b) Let $z$ be a random variable with probability density function $f(z) = \frac{1}{2}$ in the range $-1 \leq z \leq 1$. Let the random variable $x = z$ and the random variable $y = z^2$. Show that $x$ and $y$ are uncorrelated. 6

   c) Find mean and variance of random variable $x$ which is uniformly distributed between $a$ and $b$, $a < b$. 8

Q.7  a) Consider a random process $y(t)$ defined by $y(t) = \int_{t_0}^{t} x(\tau)d\tau$ where $x(t)$ is given by $x(t) = A \cos \omega t$ where $\omega$ is constant and $A = N[0; \sigma^2]$.
   i) Determine the pdf of $y(t)$ at $t = t_k$. 10
   ii) Is $y(t)$ wide sense stationary (WSS) process?

   b) Explain the term power spectral density, $S_y(f)$. Show that the power spectrum of a (real) random process is real, i.e. $S_y(-f) = S_y(f)$. 5

   c) The power spectral density of a stationary random process is given by $S_y(f) = A$, $-k < f < k$
      $S_y(f) = 0$, otherwise

      Determine the autocorrelation function. 5
End Semester Examination, May 2014
B. Tech. – Fourth Semester
DATA COMMUNICATION AND COMPUTER NETWORKS (IT-401)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is the need of data communication?
b) What are the three criteria necessary for an effective and efficient network?
c) What are the two types of time configurations?
d) Define internet and intranet.
e) Explain Nyquist theorem.
f) Define substitutional and transpositional encryptions.
g) Explain TCP/IP reference model.
h) What is the difference between ARP and RARP?
i) What is the difference between half duplex and full-duplex transmission modes?
j) What is a trap? 2x10

PART-A
Q.2 a) What do you understand by topology? Explain different types of topologies in detail. 10
b) Explain different types of transmission modes. 5
c) Why are standards needed? 5

Q.3 a) Explain unipolar and polar encoding techniques. 10
b) Explain different categories of guided media. 10

Q.4 a) Explain different categories of multiplexing. 10
b) Explain vertical redundancy check and longitudinal redundancy check. 10

PART-B
Q.5 a) What is the difference between a physical address and a logical address? 5
b) Explain IP addressing in detail. 10
c) Explain token passing and token ring. 5

Q.6 a) Explain different types of routing methods. 10
b) Explain congestion control in detail. 10

Q.7 a) Explain performance management. 5
b) Explain firewalls. 10
c) Explain quality of service. 5
End Semester Examination, May 2014
B. Tech. – Fourth Semester
DATA COMMUNICATION AND COMPUTER NETWORKS (IT-401A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define FDM.
b) What is DNS?
c) What is the purpose of network layer in an OSI model?
d) What is difference between half duplex and full duplex?
e) What is DQDB?
f) What is peer-to-peer process?
g) What is need of proxy servers?
h) What is significance of twisting in twisted-pair cable?
i) State difference between classless and classful addressing.
j) What do you mean by polling? 2x10

PART-A

Q.2
a) What do you mean by term: network? Explain types of networks. Also discuss network criteria. 10
b) Briefly explain amplitude, frequency and phase of a signal. What is the frequency of a signal in kilohertz, if period of the signal is 200 ms? 10

Q.3
a) What does Nyquist theorem have to do with data communication? How many signal levels do we need, if we need to send 265 kbps over a noiseless channel with a bandwidth of 20 kHz? 10
b) Explain data encoding schemes in detail. 10

Q.4
Write short notes on:
  a) Cyclic redundancy check with an example. 7
  b) Huffman encoding. 8
  c) Virtual circuits. 5

PART-B

Q.5
a) Explain OSI reference model. 10
b) Explain in details pure ALOHA and slotted ALOHA. How they differ in throughput? 10

Q.6
a) What is routing? How static routing is different from dynamic routing? 10
b) Discuss ATM is detail. 10

Q.7
Write notes on the following:
a) VLANs. 10
b) Quality of service. 10
End Semester Examination, May 2014
B. Tech. – Fourth Semester
JAVA PROGRAMMING (IT-402)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is synchronization?
     b) What is encapsulation?
     c) How prepared statements are created and used in Java?
     d) Explain the use of final keyword.
     e) What is logging in Java?
     f) Name the different types of drivers in jdbc.
     g) Why listeners are used in event handling?
     h) What are byte streams in Java?
     i) Explain the use of static keyword.
     j) What are abstract classes?

2x10

PART-A

Q.2  a) How objects are constructed? Explain constructor overloading with an example. 10
     b) Design an interface with a method reversal. This method takes a string as its input
        and returns the reversed string. Create a class string reversal and implement the
        method. 10

Q.3  a) Develop an applet to play an audio file.
     b) Write the difference between applet and swing.
     c) Write a program in Java that accepts a string as user input. If the string is equal to
        "hate you" then a user-defined exception "Bad String" is thrown. 10

Q.4  a) Explain event delegation model in Java.
     b) Explain the process of creating a frame in Java.
     c) Create an applet to identify the key pressed in the window and display the
        character associated with the key in the status window. 10

PART-B

Q.5  a) Explain the architecture of RMI.
     b) Write short notes on:
        i) CORBA
        ii) Java IDL

5x2

Q.6  a) How threads are created in Java? Explain with examples. 10
     b) Write a program to copy the contents of one file to other file. Get name of file from
        user through standard input. 10

Q.7  a) Write a program to display cgpa, name, rollno from student database.
     b) Explain:
        i) Row sets
        ii) Metadata. 10

5x2
End Semester Examination, May 2014
B. Tech. – Fourth Semester
BIOSTATISTICS (MA-401)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Differentiate between discrete and continuous data.
     b) Define mean deviation.
     c) What is skewness? State different kinds of skewness.
     d) Write the formula and limitation of binomial distribution.
     e) What are the chances of 5 heads in 9 tosses?
     f) What is standard error?
     g) What is null hypothesis?
     h) Define regression coefficient.
     i) Write advantage and disadvantage of parametric tests.
     j) Write application of Chi-square test of goodness.

     2x10

Q.2  a) Write short notes on the following:
     i) Histogram
     ii) Pie chart
     iii) Frequency polygon.
     b) Following grouped data is obtained in an observation of rate of reproduction of 50 fish of a species. Make a frequency polygon and frequency curve with the help of data provided:

     | Class Interval | Frequency |
     |----------------|-----------|
     | 0-10           | 3         |
     | 10-20          | 4         |
     | 20-30          | 7         |
     | 30-40          | 8         |
     | 40-50          | 9         |
     | 50-60          | 9         |
     | 60-70          | 2         |
     | 70-80          | 5         |
     | 80-90          | 2         |

     10

Q.3  a) Ovary weight of 50 fish and their frequency is given in class interval. Find standard deviation.

     | Wt of Ovary | Frequency |
     |-------------|-----------|
     | 2-2.9       | 6         |
     | 3-3.9       | 13        |
     | 4-4.9       | 11        |
     | 5-5.9       | 8         |
     | 6-6.9       | 12        |

     10

     b) The first, second, third and fourth movements of a distribution are: 0, 2.5, 0.7 and 18.75, respectively. Calculate the Kurtosis of the distribution.

     5

     c) On first January, weight of a pig was recorded as 14 kg. On first March, weight of the same pig was 20 kg. What was the approximate weight of the pig on 1st February?

     5

Q.4  a) A fair dice is thrown three times. Getting a '3' or '6' is considered a success. Find the probability of at least two successes.

     10

     b) The mortality rate of a certain disease is 5 persons per 1000 population. What is the probability for just 3 deaths due to this disease in a group of 600 persons?

     Given \(e^{-3} = 0.05\)

     10

P. T. O.
PART-B

Q.5  a) Define and explain correlation and correlation coefficient with examples.  
     b) Number of ponds in a town and number of fish were as follows. Find the rank correlation $\rho$.

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<td>330</td>
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<td>360</td>
<td>340</td>
<td>320</td>
</tr>
</tbody>
</table>

Q.6  a) Define $\chi^2$ and mention its formula. What do you mean by goodness of fit table? Explain with examples.  
     b) Explain types of sampling and errors in sampling.  

Q.7  Write short notes on:
     a) Two way ANOVA  
     b) Wilcoxon pair test  
     c) Advantage of non-parametric test  
     d) Sign test  

5x4
End Semester Examination, May 2014

B. Tech. – Fourth Semester

APPLIED MATHEMATICS (MA-441)

Time: 3 hrs

Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) State whether true or false: \( \frac{1}{2} = \sqrt{\pi} \)

b) What are the limits of \( x \) and \( y \) in:

\[
\iiint_D f(x,y) \, dx \, dy
\]

2 marks

c) Evaluate:

\[
\int_1^2 x^2 \, dx
\]

3 marks

d) Evaluate:

\[
\left[ B\left(\frac{1}{2}, \frac{3}{2}\right) \right]
\]

2 marks

e) Solve: \( p^3 - q^3 = 0 \).

2 marks

f) Prove that \( u = x^3 - y^2 - 2xy - 2x + 3y \) is harmonic.

2 marks

g) If \( f(x) \) is an odd function in \( (-a, a) \), the graph of \( f(x) \) is symmetrical about which axis?

2 marks

h) Write CR equations.

2 marks

i) Define condition for expansion of \( f(x) \) in Fourier series.

2 marks

j) What are the Cauchy-Riemann equations?

2 marks

PART-A

Q.2  a) Find the volume of the solid bounded by conical surface \((z - 2)^2 = \frac{x^3}{3} + \frac{y^3}{2}\) and the plane \( z = 0 \).

10 marks

b) i) Find by double integral, the area enclosed by the curve \( y = \frac{3x}{x^2 + 2} \) and \( y = x^3 \)

5 marks

ii) Find the value of \( \int_0^\infty \frac{x}{1 + x^6} \, dx \).

5 marks

Q.3  a) i) In what direction form \((3, 1, -2)\) is the directional derivative of \( \phi = x^2 y^2 z^4 \) maximum and what is its magnitude?

5 marks

ii) Find angle between the surfaces \( x^2 + y^2 + z^2 = 9 \) and \( z = x^2 + y^2 - 3 \) at the point \((2, -1, 2)\)

5 marks

b) Evaluate \( \iint_S \vec{A} \cdot dS \), where \( \vec{A} = 3i + xj - 3y^2z \hat{k} \) and \( S \) is the surface of the cylinder \( x^2 + y^2 = 16 \) included in the first octant between \( z = 0 \) and \( z = 5 \).

10 marks

Q.4  a) Prove that \( x^3 = \frac{\pi}{3} + 4 \sum_{n=1}^{\infty} (-1)^n \frac{\cos nx}{n^3}, -\pi < x < \pi \). Hence show that \( \sum_{n=1}^{\infty} \frac{1}{n^3} = \frac{\pi^3}{6} \).

10 marks

P. T. O.
b) Obtain the half-range cosine series for the function \( f(x) = (x-1)^2 \) in the interval \( 0 < x < 1 \). Hence show that \( \pi^2 = 8 \left( \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots \right) \).

\[ \text{PART-B} \]

Q.5  

a) i) Solve: \( z = p^2 x + q^2 y \).
   
ii) Solve \( x(y - z)p + y(z - x)q = z(x - y) \).

b) A tightly stretched string with fixed ends \( x = 0 \) and \( x = \ell \) is initially at rest in its equilibrium position. If it is set vibrating by giving to each its points a velocity \( \lambda x (\ell - x) \). Find the displacement of the string at any distance \( x' \) from one end at any time \( 't' \).

Q.6  

a) Determine the analytic function \( f(z) = u + iv \), where \( v = \log(x^2 + y^2) + x - 2y \).

b) Expand \( \frac{1}{(z^2 - 1)(z^2 + 2)} \) as a Laurent's series valid for:
   
   i) \( 1 < |z| < \sqrt{2} \)  
   
   ii) \( |z| > \sqrt{2} \)

Q.7  

a) i) State and prove convolution theorem for Fourier transforms.

   ii) Find Fourier cosine transform of \( f(x) = \begin{cases} \cos x, & 0 < x < a \\ 0, & x \geq a \end{cases} \)

b) Find the Fourier cosine integral of \( e^{-ax} \). Hence show that:
\[
\int_0^\infty \cos x \frac{e^{-ax}}{1 + ax} \, dx = \frac{\pi}{2} e^{-x}, \quad x \geq 0.
\]
End Semester Examination, May 2014
B. Tech. – Fourth Semester
APPLIED MATHEMATICS (MA-441A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Solve \( \frac{d^2x}{dt^2} + 6\frac{dx}{dt} + 9x = 0 \).
b) Write down the formula for finding P.I. by method of variation of parameters.
c) Find \( L = (\sin^3 t) \).
d) State and prove linearity property of Laplace transforms.
e) Write the sum and product of the eigen values of the matrix \( \begin{bmatrix} 1 & 2 \\ 2 & 5 \end{bmatrix} \).
f) Write the rank of the zero matrix and rank of any non-zero matrix.
g) Define normal forms of a matrix.
h) Solve \( p + q = x \).
i) Write down the Fourier integral formula for sine and cosine functions.
j) State and prove Modulation theorem for Fourier transforms.

2x10

PART-A

Q.2 a) i) Solve \( \frac{d^2y}{dx^2} + 4y = x^2 + \sin 2x \).
ii) Apply method of variation of parameters to solve:
\( \frac{d^2y}{dx^2} + 4y = x \).

5

b) Solve \( \frac{dx}{dt} = 5x + y; \quad \frac{dy}{dt} = y - 4x \).

10

Q.3 a) Find Laplace transform of \( \frac{1 - \cos t}{t^2} \).
b) State and prove convolution theorem for Laplace transforms.

10

Q.4 a) Use Gauss Jordan method to find the inverse of the matrix:
\[
A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}.
\]

10

b) Find the eigen values and eigen vectors of the matrix:
\[
A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}.
\]

10

PART-B

Q.5 a) Find the Fourier expansion for \( f(x) \) if
\[
f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases}
\]

10

P. T. O.
b) Find the half range cosine series for the function \( f(x) = (x-1)^2 \) in the interval \( 0 < x < 1 \). Hence show that \( \pi^2 = 8 \left( \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots \right) \).

Q.6  

a) i) Derive a partial differential equation by eliminating the constants from the equation: \((x-a)^2 + (y-b)^2 + z^2 = c^2\)

   ii) Using the method of separation of variable, Solve \( \frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u \)

b) Solve by Charpit's method:

   \[ \frac{\partial x}{\partial x} + \frac{\partial y}{\partial y} = \frac{\partial x}{\partial x} + \frac{\partial y}{\partial y}. \]

Q.7  

a) Find the Fourier cosine transform of \( e^{-x^2} \).

b) Find the finite Fourier transform of the function defined by:

   \[
   F(y) = \begin{cases} 
   1, & -2 < t < -1 \\
   2, & -1 < t < 1 \\
   1, & 1 < t < 2
   \end{cases}
   \]
End Semester Examination, May 2014
B. Tech. – Fourth Semester
FLUID MECHANICS (M-304A)

Time: 3 hrs

Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What do you understand by turbulent flow?
   b) Define velocity potential function and stream function.
   c) Explain the terms meta-centre and meta-centric height.
   d) Define Newton’s law of viscosity.
   e) What do you understand by hydrostatic law?
   f) What is Euler’s equation of motion?
   g) Distinguish between external mouthpiece and internal mouthpiece.
   h) What is a compound pipe?
   i) State Buckingham’s $\pi$-theorem.
   j) What is meant by boundary layer? 2x10

PART-A

Q.2 a) Explain the phenomenon of capillarity. Obtain an expression for capillary rise of a liquid. 8
   b) A rectangular pontoon 10 m long, 7 m broad and 2.5 m deep weighs 686.7 kN. It carries on its upper deck an empty boiler of 5 m diameter weighting 588.6 kN. The centre of gravity of the boiler and the pontoon are at their respective centre along a vertical line. Find the meta-centric height. Weight density of sea water is 10.104 kN/m$^3$. 12

Q.3 a) Explain the following terms:
   i) Flow net.
   ii) Rotation.
   iii) Path line.
   iv) Streak line.
   v) Stream line. 2x5
   b) The velocity components in a two-dimensional flow field for an incompressible fluid are as follows:

   \[ u = \frac{y^3}{3} + 2x - x^2y \quad \text{and} \quad v = xy^2 - 2y - \frac{x^3}{3} \]

   Obtain an expression for the stream function $\psi$. 10

Q.4 a) Derive Euler’s equation of motion along a stream line for an ideal fluid stating clearly the assumptions. 10
   b) An orifice meter with orifice diameter 10 cm is inserted in a pipe of 20 cm diameter. The pressure gauge fitted upstream and downstream of the orifice meter gives readings of 19.62 N/cm$^2$ and 9.81 N/cm$^2$, respectively. Co-efficient of discharge for the orifice meter is given as 0.6. Find the discharge of water through pipe. 10

PART-B

Q.5 a) Prove that the maximum velocity in a circular pipe for viscous flow is equal to two times the average velocity of the flow. 10

P. T. O.
b) Water at 15°C flows between two large parallel plates at a distance of 1.6 mm apart. Determine:
   i) The maximum velocity.
   ii) The pressure drop per unit length.
   iii) The shear stress at the walls of the plates if the average velocity is 0.2 m/s.
   The viscosity of water at 15°C is given as 0.01 Poise.

Q.6 a) Determine the wall shearing stress in a pipe of diameter 100 mm which carries water. The velocities at the pipe centre and 30 mm from the pipe centre are 2 m/s and 1.5 m/s, respectively. The flow in pipe is given is turbulent.
   b) Define displacement thickness. Derive an expression for the displacement thickness.

Q.7 a) What do you understand by total energy line hydraulic gradient line, pipes in series, pipes in parallel and equivalent pipe?
   b) A pipe of diameter 1.5 is required to transport an oil of specific gravity 0.90 and viscosity 3x10^-3 Poise at the rate of 3000 litre/s. Tests were conducted on a 15 cm diameter pipe using water at 20°C. Find the velocity and rate of flow in the model. Viscosity of water at 20°C = 0.01 Poise.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
THERMAL ENGINEERING-II (M-401)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain:
   a) Differentiate between fire and water-tube boilers.
   b) Thermal efficiency of Rankine cycle.
   c) Natural and artificial drafts.
   d) Critical pressure ratio.
   e) Advantages of a multi-stage compressor.
   f) P-V and T-S diagram of a dual combustion cycle.
   g) Mixture requirements for various operating conditions in an S.I. engine.
   h) Define unit of refrigeration.
   i) Knock in a C.I. engine.
   j) Comparison of jet and surface condensers.  

PART-A

Q.2 a) List out boilers mountings and accessories.  
   b) Calculate the height of chimney required to generate a pressure difference of 100 mm of water if the mean temp of gases in the chimney in 150°C and the ambient temp is 30°C. Neglect flow friction in the chimney. Assume the density of gases to be the density of air. Take R=287 J/kgK.  

Q.3 a) Explain main difference between impulse and reaction turbines.
   b) The data pertaining to an impulse turbine is as follows:
      Blade speed=300 m/s, isentropic enthalpy drop in nozzle=450 kJ/kg,
      Nozzle efficiency=0.9, Nozzle angle=20°
      Blade velocity coefficient=0.85, Blade exit angle=25°
      Sketch velocity diagrams and calculate for a mass flow of 1 kg/s:
      i) The inlet angle of moving blades.
      ii) The axial thrust.  

Q.4 a) With a line diagram show elements of a condensing plant.
   b) Explain condenser efficiency.
   c) In a condenser test the following observation were made:
      Vacuum=70 cm of Hg barometer=76 cm of Hg
      Mean temperature of condensate=34°C hot well temp=25°C
      Mass of cooling water=102000 kg per hour Inlet temp=17°C
      Outlet temp=31°C Mass of condensate per hour=2620 kg
      Find: i) The mass of air present m³ of condenser volume
            ii) The state of steam entering condenser
            iii) Vacuum efficiency.  

PART-B

Q.5 a) Describe with a neat sketch the working of an axial flow compressor.  

P. T. O.
b) A centrifugal compressor delivers 1 kg of air per second at a pressure of 2 bar and 970°C, when compressing from pressure 1 bar and temp 150°C. If the compressor is uncooled and no heat is lost to the surroundings air, determine:
   i) The index of compression
   ii) The adiabatic efficiency
   iii) Power to drive the uncooled compressor

Q.6  a) Explain the factors affecting the delay period in C.I engines.  10
     b) Describe the stages of combustion in an S.I engine with help of P-Q diagram.  10

Q.7  a) Explain the actual vapour compression refrigeration cycles with a line diagram.  10
     b) Why does a gas refrigeration cycle deviate from a reversed Carnot cycle?  10
End Semester Examination, May 2014
B. Tech. – Fourth Semester
THERMAL ENGINEERING-II (M-401A)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  Answer the following in brief:
   a) Explain an I.C. engine. How these engine are classified.
   b) Define (M.E.P.) mean effective pressure and its importance in an I.C. engine.
   c) Sketch Otto cycle on P-V and T-S diagram.
   d) Explain TDC, BDC and compression ratio.
   e) Type of nozzles.
   f) Explain impulse turbine.
   g) Explain dry bulb temperature.
   h) Explain dew point temperature.
   i) Stoichiometric air fuel ratio.
   j) Coefficient of performance (COP). 2x10

PART-A

Q.2  a) Draw diesel cycle on P-V diagram and prove that its efficiency is given by:

\[ n = \frac{1}{(R_1)^{\frac{1}{r}} \left[ \left( \frac{\rho_2}{\rho_1} \right)^{\frac{r-1}{r}} - 1 \right]} \] 10

b) In an Otto cycle engine, the pressure and temperature at the beginning of compression are 1 bar and 75°C. The temperatures at the end of heat addition are 400°C and 1450°C. Determine the compression ratio air standard efficiency and pressure at the end of adiabatic expansion. 10

Q.3  a) Explain with a diagram magneto ignition system. 6
   b) Explain the effect of engine variables on ignition lag and flame propagation. 8
   c) Compare the fuel and air consumption per kWh of the following S.I. and C.I. engines. The S.I. engine uses gasoline, specific gravity 0.72, calorific value 45000 kJ/kg and has a brake thermal efficiency of 20%. The air fuel ratio is 14. The C.I. engine uses light diesel oil, specific gravity 0.87, calorific value 43000 kJ/kg and has a brake thermal efficiency of 30%. The air fuel ratio for the diesel engine is 21. 6

Q.4  a) What is the effect of the following variables on delay period?
   i) Compression ratio. ii) Injection pressure.
   iii) Injection advance angle. iv) Engine load.
   v) Engine speed. 10

b) Following data referred to a 2-stroke engine running for 20 minutes at full load:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crank shaft speed</td>
<td>350 RPM</td>
</tr>
<tr>
<td>MEP</td>
<td>3 bar</td>
</tr>
<tr>
<td>Net brake load</td>
<td>650 N</td>
</tr>
<tr>
<td>Fuel consumption</td>
<td>1.5 kg</td>
</tr>
<tr>
<td>Jacket cooling water</td>
<td>160 kg</td>
</tr>
<tr>
<td>Water inlet temp</td>
<td>35°C</td>
</tr>
<tr>
<td>Water out temp</td>
<td>60°C</td>
</tr>
<tr>
<td>Room temp</td>
<td>=20°C</td>
</tr>
<tr>
<td>Exhaust gas temp</td>
<td>=300°C</td>
</tr>
<tr>
<td>D=20 cm and L</td>
<td>=28 cm</td>
</tr>
<tr>
<td>Brake drum dia</td>
<td>=1 m</td>
</tr>
<tr>
<td>CV of fuel</td>
<td>=42000 kJ/kg</td>
</tr>
<tr>
<td>Steam formed per kg of fuel in</td>
<td>=1.35 kg</td>
</tr>
</tbody>
</table>

P. T. O.
Q.5  
(a) Determine the expression for thermal efficiency of Rankine cycle with superheat and reheat.  
(b) Compare a jet condenser with a surface condenser.  
(c) In a condenser test the following observation were made vacuum 70 cm of Hg, barometer 76 cm of Hg, mean temp of condensate 34° C, hot well temp 29° C, mass of cooling water 102000 kg per hour, in let temp 17° C outlet temp 31° C, mass of condensate per hour: 250 kg. Find:  
(i) The mass of air present per m³ of condenser volume.  
(ii) State of steam entering condenser.  

Q.6  
(a) Explain the following terms:  
(i) Degree of saturation.  
(ii) Relative humidity.  
(iii) Absolute humidity.  
(b) Atmospheric air at 43° C and 40% relative humidity is to be conditioned to a temperature of 25° C and 50% RH. The method employed is to lower the temp to dew point of conditioned air and then to raise it to required temp. The volume of conditioned air is 25 m³/min. Find:  
(i) The dew point.  
(ii) The mass of water drained out.  
(iii) The amount of heat required to raise the temp from the dew point to that of conditioned air.  

Q.7  
(a) What is a ton of refrigeration?  
(b) Explain a vapour compression refrigeration cycle using T-S and P-H diagrams.  
(c) A refrigeration operates in an ideal vapour compression refrigeration cycle between the pressure limits of 140 kPa and 800 kPa. The circulation rate of the refrigerant is 180 kg/h. Determine:  
(i) The rate of heat removal from the refrigerated space.  
(ii) Power input to the compressor.  
(iii) COP of the machine.  
Given:  
For the refrigerant specific enthalpy of saturated vapour = 236.04 kJ/kg at 140 kPa.  
Specific enthalpy of the saturated vapour = 0.9322 kJ kg⁻¹ K⁻¹ at 140 kPa.  
Specified enthalpy of the super heated vapour = 272.05 kJ kg⁻¹ at 800 kPa.  
Specific enthalpy of the saturated liquid = 93.42 kJ kg⁻¹ at 800 kPa.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
FLUID MACHINES AND TURBO MACHINERY (M-402)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Explain the term: Impact of jets.
b) Define the term: ‘Governing of a turbine’.
c) What is cavitation?
d) Differentiate between radial and axial flow turbines.
e) What are the uses of a draft tube?
f) Explain the concept of model analysis.
g) Differentiate between single-stage and multi-stage pumps.
h) Explain characteristic curves of pump.
i) How will you classify the reciprocating pumps?
j) Define indicator diagram for reciprocating pumps.

PART A

Q.2
a) Obtain an expression for the force exerted by a jet of water on flat vertical plate moving in the direction of the jet.

b) A jet of water having a velocity of 15 m/s, strikes a curved vane which is moving with a velocity of 5 m/s in the same direction as that of the jet at inlet. The vane is so shaped that the jet is deflected through 135°. The diameter of the jet is 100 mm. Assuming the vane to be smooth. Find:
i) Force exerted by jet on the vane in the direction of motion.
ii) Power exerted on the vane.
iii) Efficiency of the vane.

Q.3
a) Describe briefly the functions of various main components of Pelton turbine with neat sketches.

b) The following data is related to a pelton wheel:
   Head at the base of the nozzle =80 m
   Diameter of the jet =100 mm
   Discharge of the nozzle =0.30 m³/s
   Power at the shaft =206 kW
   Power absorbed in mechanical resistance =4.5 kW.
   Determine:
i) Power lost in nozzle.
ii) Power lost due to hydraulic resistance in the runner.

Q.4
a) Differentiate between an inward and an outward flow reaction turbine.
b) Explain how cavitation can be avoided in a reaction turbine?
c) A Kaplan turbine runner is to be designed to develop 9100 kW. The net available head is 5.6 m. If the speed ratio =2.09, flow ratio=0.68, overall efficiency 86 % and the diameter of the boss is ½ the diameter of the runner, find the diameter of the runner, its speed and the specific speed of the turbine.

P. T. O.
Q.5  
a) Explain the causes of cavitation, its harmful effects and prevention.  
b) Define the term ‘unit power’ and ‘unit discharge’ with reference to a hydraulic turbine. Also derive expressions for these terms.

Q.6  
a) Draw and discuss the operating characteristic curves of a centrifugal pump.  
b) The diameter of centrifugal pump, which is discharging 0.03 m³/s of water against a total head of 20 m is 0.40 m. The pump is running at 1500 rpm. Find the head, discharge and ratio of powers of geometrically similar pump of diameter 0.25 m when it is running at 3000 rpm.

Q.7  
a) What is an air vessel? Describe the function of the air vessel for reciprocating pumps.  
b) The cylinder bore diameter of single acting reciprocating pump is 150 mm and its stroke is 300 mm. The pump runs at 50 rpm and lifts water through a height of 25 m. The delivery pipe is 22 m long and 100 mm in diameter. Find theoretical discharge and the theoretical power required to run the pump. If the actual discharge is 4.2 litres/s, find the percentage slip.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
STRENGTH OF MATERIALS (M-403)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What do you mean by temperature stress? Explain.
b) State the assumptions made in bending equation.
c) Define the terms: torsion, torsional rigidity, polar moment of inertia.
d) For a circular bar subjected to axial load, state the expression for strain energy in terms of:
   i) Load.  
   ii) Stress.  
   iii) Elongation of bar.
e) What is the importance of wire winding of thin cylinders?
   4x5

PART-A

Q.2
a) Deduce the expression for extension of square tapering bar under action of load ‘P’.
   10
b) A rectangular block of material is subjected to a tensile stress of 100 MPa on a plane and 40 MPa on a plane at right angles to the former, together with a shear stress of 60 MPa on the same planes. Find:
   i) The direction of principal planes.
   ii) Magnitude of principal stresses.
   iii) Magnitude of greatest shear.
   10

Q.3
a) Derive an expression for maximum deflection for simply supported beam carrying concentrated load at mid span.
   10
b) A wooden beam is 8 cm wide and 12 cm deep with semicircular groove of 2 cm radius planned out in the centre of each side. Calculate the stress on the section of mid span, when simply supported on a span of 3 m, loaded with concentrated load of 450 N at a distance of 1 m from the one end and a uniformly distributed load of 500 N/m over the whole span.
   10

Q.4
a) A composite shaft consists of steel rod of 10 cm diameter surrounded by a closely fitting tube of brass fixed to it. Find the outside diameter of the tube so that when a torque is applied to the composite shaft, it will be equally shared by the two materials. Take G for steel= 80 GPa and G for brass =40 GPa.
   10
b) A hollow shaft of diameter ratio \( \frac{D}{d} \) is required to transmit 80 kW at 110 rpm. The maximum torque being 20% greater than the mean if the shear stress is not to exceed 63 GPa, find the external diameter of the shaft.
   10

PART-B

Q.5
a) A hammer weighing 100 N falls 1.25 m on a 5 cm cube iron block before coming to rest. Find the distance the block will be compressed and the constantaneous stress induced in it. Take E=200 GPa.
   10
b) State and prove Castigliano’s theorem.
   10

P. T. O.
Q.6  a) Derive an expression for change in volume of thin pressure vessel of cylindrical shape.
b) The cylinder of hydraulic press has an internal diameter of 30 cm and is to be designed to withstand a pressure of 10 MPa without the material being stressed over 20 MPa. Determine the thickness of the material. Sketch a diagram showing the variation of radial and hoop stresses across the thickness of wall of cylinder.

Q.7  a) Derive an expression for shear stress in a closed coiled helical spring under axial load.
b) Derive the Euler's crippling load for a column hinged at both ends.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
STRENGTH OF MATERIALS (M-403A)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Write an expression for planes having maximum or minimum shear stress for the case of a body subjected to biaxial and shear stress conditions.
b) Explain the terms: slope and deflection in beams with the help of a sketch.
c) State and explain the significance of the assumptions made in deriving the torsion equation.
d) Write the expressions for deflection and shear stress in closed coiled helical spring under axial load.
e) What do you mean by pressure vessels? What type of stresses act upon them? 4x5

PART-A

Q.2 a) Construct and prove the Mohr circle for like biaxial stresses. 10
b) A rod consisting of 1 m copper and 5 m steel is of constant cross section and is clamped at both ends. After clamping the rod, its temperature is increased by 50° C. Determine the stresses in rod.
   Given: E for steel =210 GPa, E for copper=105 GPa
   \( \alpha_{steel} = 10 \times 10^{-6}/^\circ C, \ \alpha_{copper} = 15 \times 10^{-6}/^\circ C. \) 10

Q.3 a) Derive an expression for slope and deflection of cantilever beam carrying uniformly distributed load. 10
b) A beam of I section is simply supported and carries a load of 20 kN/m over entire span of 3 m. Determine the maximum tensile and compressive stresses on the beam. The cross section is as shown below:

Q.4 a) A steel shaft is to transmit 75 kW at 200 rpm. The allowable shear stress is 70 MPa and max torque is 30% higher than mean torque. Find suitable diameter of the shaft. 10
b) What is the torque transmitted by a thick tube 5 cm internal diameter and 5 mm thick when shear stress is not to exceed 41 MPa? Find the angle of twist in a length at 2.5 m and the shear stress at inner periphery. Take G=80 GPa. 10

P. T. O.
PART-B

Q.5  a) An unknown weight falls through 1 cm on a collar rigidly attached to the lower end of vertical bar 3 m long and 6 cm² in section. If the maximum instantaneous extension is known to be 2 mm, what is the value of the weight. 10
     b) A rectangular beam of 6x4 cm cross section is simply supported and is 3 m long. It carries at concentrated load of 10 kN for one of the ends. Determine the strain energy due to bending in the beam. Take E=210 GPa. 10

Q.6  a) A thin cylindrical shell, 80 cm in diameter and 3 m long, is having 1 cm metal thickness. If the shell is subjected to an internal pressure of 2.5 MPa. Determine:
        i) Change in diameter.
        ii) Change in length.
        iii) Change in volume. 10
     b) A thick spherical shell 25 cm internal diameter and 5 cm thick as subjected to an internal pressure of 12 MPa. Determine the variation of radial and hoop stresses in the shell. 10

Q.7  a) What are limitations of Euler's formula? Derive the crippling load for a column fixed at both ends. 10
     b) A helical spring in which the mean diameter of the coils is 8 times the wire diameter is to be designed to absorb 200 N-m of energy with an extension of 10 cm. The maximum shear stress is not to exceed 12 MPa. Determine the mean diameter of the wire and number of turns. Take G=84 GPa. 10
End Semester Examination, May 2014
B. Tech. – Fourth Semester
MANUFACTURING TECHNOLOGY-II (M-404)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions
from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is the difference between planner and shaper?
     b) Name four different types of cutting tool materials.
     c) Define machinability.
     d) How build-up-edges are formed?
     e) Why gear finishing is required?
     f) State the principle of each USM works.
     g) State the advantages of LBM over EBM.
     h) What is tolerance stacking?
     i) State 3-2-1 location principle.
     j) Define limits and fits.

     PART-A

Q.2  a) Differentiate between orthogonal and oblique cutting.
     b) Draw the merchant’s circle diagram and derive the relationship between the
cutting forces.

Q.3  a) State the properties of tool material.
     b) State the properties of cutting fluid.
     c) Explain different types of tool wear.

Q.4  Write short notes on:
     a) Gear hobbing.
     b) Gear milling.

     PART-B

Q.5  a) State the basic principle mechanism of material removal and explain the working
     of electro-chemical machining process.
     b) State the principle on which laser beam machining works.

Q.6  With the help of neat diagrams explain various types of locating and clamping
devices.

Q.7  Write short notes on:
     a) Methods of linear measurement.
     b) Methods of angular measurement.
End Semester Examination, May 2014  
B. Tech. – Fourth Semester  
MANUFACTURING TECHNOLOGY-II (M-404A)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.  

Q.1  
a) Explain the difference between continuous and segmented chips.  
b) List various functions of cutting fluids.  
c) What is meant by a tool life? State Taylor’s equation for tool life and explain the symbols used.  
d) What do you mean by a machine tool? How will you specify a lathe?  
e) Describe the feature of a broach and explain its functions.  

PART-A  

Q.2  
a) Draw a Merchant’s circle diagram and derive expressions to show relationships among the different forces acting on a cutting tool.  
b) Discuss the heat distribution on chip, work and tool during machining operation.  

Q.3  
a) What are the main factors which influence the tool life? Explain.  
b) Determine the tool life of HSS tool for machining a mild steel bar at a cutting speed of 40 m/min. If tool life is 60 min, find the cutting speed. Take n=0.2 and c=80.  

Q.4  
a) Derive an expression for optimum cutting speed in turning for minimum production cost.  
b) Explain the term “total cost of machining”.  

PART-B  

Q.5  
a) With the help of a neat sketch, show the main parts of a milling machine.  
b) Briefly describe the working principle of a slitter.  

Q.6  
a) What machining operations can be performed on a centre lathe? Explain taper turning process in detail.  
b) Discuss the effect of tool geometry on cutting speed feed, depth of cut in a lathe.  

Q.7  
a) With help of a neat sketch, show the different angles of a drill and explain them.  
b) What is broaching? How different types of broaching are classified?
End Semester Examination, May 2014
B. Tech. – Fourth Semester
KINEMATICS OF MACHINES (M-405)

Time: 3 hrs   Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly explain:
   a) Inversions of a kinematic chain.
   b) Reverted gear train.
   c) Pressure angle in a gear.
   d) Pitch point in a cam.
   e) Chebychev spacing.
   f) Train value of a gear train.
   g) Kinematic pair.
   h) Circular pitch of a gear.
   i) Prime circle in a cam.
   j) Kennedy's theorem.  2x10

PART-A

Q.2 a) Describe differences between machine and structure.  5
   b) Derive the fundamental equation for correct steering for a steering gear mechanism.  5
   c) Calculate degrees of freedom of the mechanism in the figure below:

   ![Diagram of mechanism]

   d) Differentiate between higher pair and lower pair.  4

Q.3 The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 rpm. The crank is 150 mm and the connecting rod is 600 mm long. At a crank angle of 45° from inner dead centre position, see the given figure.

   ![Diagram of mechanism]

   Determine:
   a) Linear velocity and acceleration of the midpoint of connecting rod.
   b) Angular velocity and angular acceleration of the connecting rod.

P. T. O.
Q.4  a) Derive an expression for minimum number of teeth on the pinion to avoid interference.  
       b) A pinion having 30 teeth drives a gear having 80 teeth. The gears have involute teeth, 20° pressure angle, 12 mm module and 10 mm addendum. Find the length of path of contact, arc of contact and contact ratio.

PART-B

Q.5  a) Describe a compound gear train. Derive an expression for train value of a compound gear train.
       b) In the compound epicyclic gear train shown in given figure pinion A has 15 teeth and is fixed to input shaft; gear B with 20 teeth meshes with pinion A and annular fixed wheel E. B and C is a compound gear. Gear C has 15 teeth and it meshes with annular wheel D. Wheel D is connected to output shaft. Arm rotates about the same shaft on which A is fixed and carries compound gear B, C. If the input shaft runs at 800 rpm, find the speed of the output shaft. If input shaft exerts a torque of 200 N-m, find the torque exerted on the output shaft.

Q.6  A cam with a minimum radius of 50 mm, rotating clockwise with uniform speed, is required to give a knife edge follower the motion as described below. The follower moves with uniform acceleration and uniform retardation:
       a) Moves outwards 40 mm during 100° rotation of cam.
       b) Dwell for next 80°.
       c) Return during next 90°.
       d) Dwell for the remaining period i.e. 90°.
   Line of motion of follower passes through the cam shaft centre. Draw the profile of the cam.

Q.7  a) In synthesis of mechanisms, explain the terms: function generation, path generation and body guidance.
       b) A four bar mechanism is to be designed, by using three precision points, to generate the function \( y = \sin x \) for \( 0 \leq x \leq 90° \). The range of input crank is 120° and that of output crank is 60°. Precision points are to be chosen by Chebychev's spacing. Take \( \theta_i = 105° \) and \( \phi_i = 66° \). Find the values of \( x, y, \theta \) and \( \phi \) corresponding to three precision points.
End Semester Examination, May 2014
B. Tech. – Fourth Semester
KINEMATICS OF MACHINES (M-405A)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly explain:
   a) Self-closed and force closed pairs.
   b) Contact ratio in a pair of gears.
   c) Epicyclic gear train.
   d) Cylindrical cam.
   e) Length of arc of contact.
   f) Speed ratio in a gear train.
   g) Successfully constrained motion.
   h) Type, number and dimensional syntheses in synthesis of mechanism.
   i) Pressure angle in cam and follower.
   j) Type of instantaneous centres for a mechanism. 2x10

PART-A

Q.2 a) Explain with the help of neat sketches any two inversions of single slider chain. 10
   b) Define degrees of freedom for plane mechanism and explain Kutzbach criterion for movability of a mechanism. 5
   c) Find number of degrees of freedom for the mechanism shown in the figure:

   ![Diagram](image)

   5

Q.3 a) Derive an expression for length of path of contact for a pair of wheel and pinion. 8
   b) A pair of gears have velocity ratio 3 to 1 involutes form, module 6 mm, addendum = one module, pressure angle 20°. The pinion rotates at 90 rpm. Determine:
      i) Number of teeth on pinion to avoid interference and corresponding number of teeth on wheel.
      ii) Lengths of path and arc of contact.
      iii) The number of pairs of teeth in contact. 12

Q.4 a) In the compound epicyclic gear train shown in figure, wheel A, D and E are free to rotate independently on spindle O while B and C are compound and rotate together on spindle P. All teeth have same module. Number of teeth on A, B and C are 12, 30 and 14, respectively.

   P. T. O.
If wheel A rotates 1 rps clockwise while D is driven 5 rps counter-clockwise, find the magnitude and direction of angular velocities of arm OP and wheel E.

b) Explain reverted gear train and discuss the expression for speed ratio for the same.

**PART-B**

Q.5 a) Explain radial cam and cylindrical cam with neat sketches.
   b) A cam is to give following motion to a knife edged follower: outstroke during 60° cam rotation, dwell for the next 30° return stroke during next 60° and dwell for the remaining 210° cam rotation.
   The stroke of the follower is 40 mm; minimum radius of cam is 50 mm, the follower moves with uniform velocity during both outstroke and return strokes.
   The axis of the follower is offset by 20 mm from the axis of the cam shaft.
   Draw the profile of the cam.

Q.6 a) What are precision points for function generation? Describe graphical method for obtaining precision points.
   b) Describe step-wise, with neat sketches, the graphical synthesis of slider crank mechanism.

Q.7 a) State and prove the Kennedy theorem.
   b) The crank and connecting rod of a theoretical steam engine are 100 mm and 400 mm long respectively. The crank rotates 200 rpm in clockwise direction. When it has turned 45° from its inner dead centre, determine:

   i) Velocity of the piston.
   ii) Angular velocity of connecting rod.
   iii) Velocity of point E on the connecting rod 300 mm from the gudgeon pin.
End Semester Examination, May 2014
B. Tech. – Fifth Semester
AIRCRAFT PROPULSION-II (AE-502)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.
(Take: For air as working medium, use $\gamma = 1.4$, $c_p = 1005 \text{ J/kg K}$ and $R = 287 \text{ J/kg K}$
For hot gas as working medium, use $\gamma = 1.33$, $c_p = 1148 \text{ J/kg K}$ and $R = 287 \text{ J/kg K}$)

Q.1  a) What is isentropic efficiency in context to gas turbine engines?
b) What is pre-whirl and how does it affects performance of a centrifugal compressor?
c) What is the De-Haller number?
d) What are stagnation flow properties and explain their importance in thermodynamic cycle analysis?
e) Define bypass ratio of a turbofan engine; explain two categories of flows present because of bypass.
f) What is the slip factor?
g) What is degree of reaction of a turbo-machine?
h) Explain the stalling phenomenon in a compressor.
i) Explain the characteristic map or plot of an axial flow turbine.
j) Explain the difference between axial and radial flow turbo machine.

PART-A

Q.2  a) Explain the purpose of using diffuser in a gas turbine engine for aircraft propulsion. Use thermodynamic cycle analysis to explain ram efficiency of a diffuser.
   b) Describe different invariable limitations encountered during designing a gas turbine engine for aircraft propulsion compared to an industrial turbine.

Q.3  a) The effective jet exit velocity from a jet engine is 2700 m/s. The forward velocity is 1300 m/s and air flow rate is 76 kg/s. Calculate:
   i) Thrust    ii) Propulsive efficiency
   b) Explain the term thrust augmentation. Describe the most common method used for thrust augmentation in fighter aircrafts.

Q.4  a) Describe working and essential parts of a centrifugal compressor.
b) Calculate overall pressure ratio of centrifugal compressor with following specifications:
   | Speed | Impeller Diameter | Inlet Total Temperature | Slip factor |
   | 12000 rev/min | 75 cm | 25°C | 0.9 |
   | Compressor Efficiency | 78%

PART-B

Q.5  Blades of a typical axial flow compressor are designed using free-vortex law. Blades throughout the stage have hub-to-tip radius ratio 0.9. At rotor tip (1 m dia) the flow angles are given as $\alpha_1 = 30^\circ$, $\beta_1 = 60^\circ$ and degree of reaction 0.5.
   Calculate:
   i) Axial velocity, constant from root to tip.
   ii) Flow angles at rotor blade mean radius, WRT axial.
   iii) Degree of reaction at mean radius.

P. T. O.
Q.6  
a) With the help of a generic diagram explain the flow physics inside a can type combustion chamber. Also explain why atomization and evaporation of fuel is done before combustion process. 

b) Explain the important combustion chamber performance parameters.

Q.7  
A single stage gas turbine operates at its design condition with an axial absolute flow at entry and exit from the stage. The flow angle at stator nozzle exit is $70^\circ$. At stage entry, the total pressure and temperature are $311 \text{kPa}$ and $850^\circ \text{C}$. The exhaust static pressure is $100 \text{kPa}$. The total to static efficiency is 0.87 and mean blade speed is $500 \text{ m/s}$. Assume constant axial velocity through the stage.

Determine:

i) Work Output.

ii) Mach number leaving the stator.

iii) Axial velocity.

iv) Stage reaction.
End Semester Examination, May 2014
B. Tech. – Fifth / Sixth Semester
AIRCRAFT STRUCTURES-II (AE-503)

Time: 3 hrs
Max Marks: 100
No. of pages: 3

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What type of columns are designed to prevent material elastic failure?
   b) Define slenderness ratio?
   c) State the principle of the stationary value of the total complementary energy?
   d) Differentiate between tangent modulus equation and reduced modulus equation?
   e) Define Buckling?
   f) What are the basic functions of an aircraft’s structure?
   g) Derive the stiffness matrix for an elastic spring?
   h) What are the implications of structural idealization?
   i) Define margin of safety?
   j) Why bolt holes are always slightly larger than the bolt diameter? 2x10

PART-A

Q.2 A pin-ended column of length \( l \) and constant flexural stiffness \( EI \) is reinforced to give a flexural stiffness \( 4EI \) over its central half. (see figure below)

\[
\text{\textbullet} \hspace{1cm} \text{\textbullet} \hspace{1cm} \text{\textbullet} \\
\text{\textbullet} \hspace{1cm} \text{\textbullet} \hspace{1cm} \text{\textbullet} \\
\text{\textbullet} \hspace{1cm} \text{\textbullet} \hspace{1cm} \text{\textbullet}
\]

Considering symmetric modes of buckling only, obtain the equation whose roots yield the flexural buckling loads and solve for the lowest buckling load. 20

Q.3 The sheet stringer panel shown in figure below is loaded in compression by means of rigid members. The sheet is assumed to be simply supported at the loaded ends and at the rivet lines and to be free at the sides. Each stinger has an area of 0.1 m². Assume \( E = 10,30,000, \text{lb/in}^2 \) for the sheet and stringers. Find the total compressive load \( P \):
   a) When sheet buckles first.
   b) When the stringer stress \( \sigma_c \) is 15,000 lb/in²
   c) When the stringer stress \( \sigma_c \) is 35,000 lb/in²

\[
\text{\textbullet} \hspace{1cm} \text{\textbullet} \hspace{1cm} \text{\textbullet} \\
\text{\textbullet} \hspace{1cm} \text{\textbullet} \hspace{1cm} \text{\textbullet}
\]

Given: \( K = 3.62 \)

7
7
6

P. T. O.
Q.4  a) Determine the vertical deflection of the free end of the cantilever beam shown in the figure below:

\[ \text{Diagram of the cantilever beam with deflection at the free end.} \]

b) Determine the rotation, i.e. the slope, of the beam \( ABC \) shown in figure below at \( A \).

\[ \text{Diagram of the beam with rotation at point A.} \]

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**PART-B**

Q.5  Use the stiffness method to find the ratio \( H/P \) for which the displacement of node 4 of the plane pin-jointed frame shown loaded in figure below is zero, and for that case give the displacements of node 2 and 3. All members have equally axial rigidity \( EA \).

\[ \text{Diagram of the pin-jointed frame with applied load.} \]

Given data:

\[ \begin{align*}
F_{x,1} &= k_{11} u_1 + k_{12} u_2 + k_{13} u_3 \\
F_{y,1} &= k_{21} u_1 + k_{22} u_2 + k_{23} u_3 \\
F_{x,2} &= k_{31} u_1 + k_{32} u_2 + k_{33} u_3 \\
F_{y,2} &= k_{41} u_1 + k_{42} u_2 + k_{43} u_3 \\
F_{x,3} &= k_{51} u_1 + k_{52} u_2 + k_{53} u_3 \\
F_{y,3} &= k_{61} u_1 + k_{62} u_2 + k_{63} u_3
\end{align*} \]

Q.6  a) Idealize the box section shown in figure below into an arrangement of direct stress carrying booms positioned at the four corners and panels which are assumed to
carry only shear stresses. Hence determine the distance of the shear centre from the left hand web.

b) Figure below shows the cross-section of a single cell, thin-walled beam with a horizontal axis of symmetry. The direct stresses are carried by the booms $B1$ to $B4$. While the walls are effective only in carrying shear stresses. Assuming that the basic theory of bending is applicable, calculate the position of the shear centre $S$. The shear modulus $G$ is the same for all walls.

Cell area: $135000 \text{ mm}^2$, Boom areas: $B1 = B4 = 450 \text{ mm}^2$, $B2 = B3 = 550 \text{ mm}^2$

Given data:

$$q_s = \left( \frac{S_{s1} - S_{s2}}{I_{s1} - I_{s2}} \right) \left( \int_{0}^{\infty} tdy \, ds + \sum_{r=1}^{n} B_r s_r \right) - \left( \frac{S_{s1} - S_{s2}}{I_{s1} - I_{s2}} \right) \left( \int_{0}^{\infty} tdx \, ds + \sum_{r=1}^{n} B_r s_r \right) + q_n$$

$$B_1 = \frac{tD^1}{6} \left( \frac{2 + \sigma_2}{\sigma_1} \right)$$
$$B_2 = \frac{tD^1}{6} \left( \frac{2 + \sigma_3}{\sigma_2} \right)$$

Q.7 The fitting shown in the figure is made of a 2014 aluminum forging, for which $\sigma_{aw} = 65000$, $\tau_o = 39000$ and $\sigma_{obs} = 98000 \text{ lb/in}^2$. The bolt and bushing are made of steel for which $\sigma_{aw} = 125000$, $\tau_o = 75000$ and $\sigma_{obs} = 175000 \text{ lb/in}^2$. The fitting resists limit or applied loads of $15000 - \text{lb compression}$ and $12000 - \text{lb tension}$. The fitting factor of 1.2 and a bearing factor of 2.0 are used. Find the margins of safety for the fitting for various types of failure.
End Semester Examination, May 2014
B. Tech. – Fifth Semester
FLIGHT MECHANICS-I (AE-504)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer any ten of the following:
   a) In the gradient region of the standard atmosphere, the pressure variation is given by the relation \( p_1/p_2 = \ldots \)
   b) Define the standard atmosphere.
   c) Explain the viscous flow.
   d) Laminar shear stress is less/more than the turbulent shear stress.
   e) Turbulent boundary layer thickness is given by \( \delta = \ldots \)
   f) Explain the difference between an infinite and a finite wing.
   g) For max endurance for a jet aircraft we must fly such that \( L/D \) is \ldots
   h) For maneuvering performance it is advantageous to have the \ldots possible \( R \) and \ldots possible \( \omega \).
   i) What is wing loading?
   j) Explain the features of V-n diagram

\[ \text{PART-A} \]

Q.2 a) Draw the relation for pressure and density variation in the isothermal regions of the standard atmosphere. 8
b) Calculate the standard values of \( T \), \( P \), and \( \rho \) at a geopotential altitude of 14 km. 12

Q.3 a) Illustrate a turn and bank indicator and explain its functioning.
   b) Differentiate between IAS, CAS and TAS.
   c) How IAS is obtained? 4

Q.4 a) Explain the generation of wave drag at supersonic speed.
   b) Give the approximate relations for the lift \( C_l \) and supersonic wave drag \( C_{sw} \).
   c) Calculate the lift and wave drag coefficient and the lift and wave drag per unit span for supersonic flow in a mach 3 free stream at a standard altitude of 6069 m over a thin airfoil with chord length \( c = 1.524 \, m \) and an angle of attack of \( 5^\circ \).
   [at 6069 m, take \( \rho_0 = 0.654 \, Kg/m^3 \) and \( T = 248.6 \, K \)] 10

\[ \text{PART-B} \]

Q.5 Illustrate the various leading and trailing edge high lift devices. Explain how these affect the max lift coefficient. 20

Q.6 a) Show that for minimum thrust condition, zero lift drag is equal to drag due to lift.
   b) Calculate the thrust required at sea level for level flight for an aircraft with weight=13120 N, wing area=16 sq m, span=10.8 m, parasite drag coefficient=0.025 and Oswald efficiency factor \( e = 0.81 \) flying at a speed of 60.96 m/s. 14

Q.7 a) Derive a relation for take-off distance for an aircraft.
   b) Estimate the lift-off distance for a jet aircraft weighing 88176 N with wing span=16.25 m, wing area=29.54 sq m, two turbofan engines of 16242 N thrust each at sea level, parasite drag coefficient=0.02, Oswald efficiency factor=0.81, \( C_{L_{max}} = 1 \), coefficient of rolling friction=0.02, height of wings above ground=1.82 m. 10
End Semester Examination, May 2014
B. Tech. – Fifth Semester
DESIGN OF AUTOMOBILE COMPONENTS (AU-601)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is endurance limit?
b) What criteria is included for designing a shaft?
c) What do you mean by completely reversed or cyclic stresses?
d) What is lateral rigidity?
e) Classify springs according to shapes.
f) Define spring index, spring rate and pitch of a spring.
g) Classify bearings depending upon nature of contact.
h) What is splash lubrication system?
i) Define wear tooth and static tooth load.
j) What is the function of connecting rod in an IC engine? 2x10

PART-A

Q.2 a) Define load and explain its various types. 10
b) Explain the procedure for designing a shaft. 10

Q.3 a) Explain surge in springs. 8
b) A compression coil spring made of an alloy steel is having following specifications:
   Mean diameter of coil=50 mm, wire diameter=5 mm, No of active coil=20. Find
   spring index and shear stress factor. If the spring is subjected to an axial load of
   500 N, calculate maximum shear stress (Neglect the curvature effect) to which
   the spring material is subjected. 10

Q.4 a) Enumerate advantages of rolling contact bearings over sliding contact bearings. 5
b) The thrust of propeller shaft is absorbed by 6 collars. The rubbing surface of these
   collars have outer diameter 300 mm and inner diameter 200 mm. If the shaft runs
   at 120 rpm the bearing pressure amounts to 0.4 N/mm². The coefficient of friction
   may be taken as 0.08. Assuming that the pressure is uniformly distributed,
   determine the power absorbed by collars. 15

PART-B

Q.5 a) What are the reasons for dynamic tooth load? 5
b) A bronze spur pinion rotating at 600rpm, drives a cast iron spur gear at a
   transmission ratio of 4:1. The allowable static stresses for bronze pinion and C.I.
   gear are 84 MPa and 105 MPa, respectively. The pinion has 16 standard 20° full
   depth involute teeth of module 8 mm. The face width of both gears is 90 mm.
   Find the power that can be transmitted from the stand point of strength. Assume
   velocity factor $C_v = \frac{3}{3+\nu}$ and form factor for 20° full depth involute teeth
   $\left( r_p \right) = 0.154 - \frac{0.192}{r_p}$ and for gear $\left( r_g \right) = 0.154 - \frac{0.192}{r_g}$ 15

P. T. O.
Q.6  a) What is the function of flywheel in an I.C. engine? How does it differ from functioning of governor?

b) A 4-stroke diesel engine has following specifications:
   \[ BW = 5 \text{ kW}, \quad \text{speed} = 1200 \text{rpm}, \quad \text{IMEP} = 0.35 \text{ N/m}^2, \quad \text{mechanical efficiency} = 80\% \]
   Assume \( L/D = 1.5 \).
   Determine:
   i) Bore
   ii) Length of cylinder taking clearance on both sides of cylinder equal to 15\% of stroke.

Q.7  Write short notes on:
   a) Design consideration of a piston.
   b) Forces acting on a connecting rod.
   c) Various types of cylinder liners.
   d) Methods and materials used in manufacture of crankshaft.
End Semester Examination, May 2014
B. Tech. – Fifth Semester
BIOREACTOR AND BIOPROCESS ENGINEERING (BT-502)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What do you know about containment?
b) Briefly explain the concept of scale-up.
c) Write down the features of disc-turbine impellers.
d) Give an expression for rate of product formation for 1st metabolites.
e) Explain the role of precursors in fermentation media.
f) What are mechanically-agitated reactors?
g) What do you know about temperature probe used in a fermenter?
h) Enlist the factors affecting choice of N-source in a fermentation medium.
i) What do you mean by channeling of fluid?
j) Give the energy-balance equation for an adiabatic process.

 PART-A

Q.2 a) "Benefits of biotechnology could not be realized without bioprocess engineering". Justify the statement with suitable examples.
b) Draw a comparison between the approach of a biologist and an engineer.
c) Briefly discuss some historical aspects of bioprocess engineering.

Q.3 a) Give a detailed account of cell growth kinetics in a continuous culture.
b) Discuss the kinetics of product formation in a bioprocess.

Q.4 Differentiate between the following:
a) Airlift bioreactor and bubble column reactor.
b) Radial and axial flow patterns.
c) Glass fermenter and stainless-steel fermenter.
d) Packed-bed and fluidized-bed bioreactor.
e) Sterilization and containment.

 PART-B

Q.5 a) Draw a comparison between the following:
i) Undefined complex raw material and pure substrates.
ii) Carbohydrates and hydrocarbons as C-source in fermentation medium.
b) Define foaming. Discuss various approaches for foam control in a bioprocess.

Q.6 a) What are the limitations of a batch sterilization process? How are they overcome?
b) Discuss in detail the design of a depth-filter.
c) How do we sterilize the heat-sensitive materials used in a bioprocess?

Q.7 a) Discuss in detail the factors affecting cellular O2-demand.
b) Discuss the effect of stirring and sparging on oxygen transfer rates in a submerged fermentation process.
c) What are the limitations of static-gassing-out technique for measurement of Koa?
End Semester Examination, May 2014
B. Tech. (Biotechnology) – Fifth Semester
ANIMAL BIOTECHNOLOGY (BT-506)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
(2) a) Name the common contaminants found in cell cultures.
(2) b) What is a feeder layer?
(3) c) Name the cryoprotectants used in cryopreservation medium. Explain their role in the preservation medium.
(3) d) What are limitations of retroviral vector method for production of transgenic animals?
(3) e) Enlist the properties of vectors suitable for gene therapy. Give examples.
(2) f) What are the advantages of a baculovirus expression system?
(3) g) How has human genome project benefited science?
(2) h) Give the applications of anti-sense RNA technology.

PART-A

Q.2  
(10) a) Explain in detail the scope of animal biotechnology.
(5) b) Explain the following sentence: "Good aseptic techniques are indispensable in a cell culture laboratory.
(5) c) What is the role of trypsin-EDTA in cell culture?

Q.3  
(10) a) What are features of transformed cell lines?
(5x2) b) Write short notes on:
   i) Culture of pancreatic islet cells
   ii) Organ culture.

Q.4  
(20) Explain in detail the technique of cloning by nuclear transfer method.

PART-B

Q.5  
(7) a) What are features of a cloning vector?
(8) b) Explain the difficulties in gene therapy.
(5) c) Discuss the advantages of eukaryotic expression system over prokaryotic system.

Q.6  
(10) a) Explain giving a suitable example the role of tumor suppressor genes in prevention of cancer.
(10) b) Discuss various modes of extinction of gene function.

Q.7  
(20) Discuss applications of stem cell therapy.
End Semester Examination, May 2014  
B. Tech. – Fifth Semester  
TRANSPORTATION ENGINEERING-I (C-501)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.  

Q.1  Explain briefly:  
a) Star and grid pattern.  
b) PIEV theory.  
c) Spot speed and running speed.  
d) Scope of traffic engineering.  
e) Semi-rigid pavement.  
f) Cant deficiency.  
g) Right of way.  
h) Recommendations of Jayakar Committee.  
i) Basic requirements of an alignment.  
j) Features of Lucknow road plan.  

PART-A  

Q.2  
a) Compare the Nagpur road plan and the Bombay road plan. Discuss the merits of each.  
b) Calculate the length of NH with a total area of 7200 km², developed, semi-developed and un-developed areas being 30, 45 and 25% the number of towns with population over 1.0, 0.5–1.0, 0.2–0.5 and 0.1–0.2 lac are 3, 7, 12 and 20, respectively. Use Bombay road plan.  

Q.3  
a) Explain briefly various stages of surveys in a new highway project.  
b) Explain obligatory points. With sketches, discuss how do these control the alignment.  

Q.4  
a) Calculate SSD on a highway at a descending gradient of 2% for a design speed of 80 km/h. Assume other data as per IRC recommendations.  
b) Design the super-elevation required at a horizontal curve of radius 500 m for speed of 100 km/h. Assume suitable data.  

PART-B  

Q.5  
a) Define basic capacity, possible capacity and practical capacity. Estimate basic capacity of a traffic lane at a speed of 60 km/h. All the vehicles are of length 6 m.  
b) Discuss the various traffic studies and their importance.  

Q.6  
a) Discuss various factors to be considered in pavement design. Discuss significance of each.  
b) Explain rigid and flexible pavements and bring out point of differences. Also write down the steps used to calculate interior, edge and corner stresses.  

Q.7  
a) What are the ballasts? Write down the material used as ballast with their merits and demerits.  
b) Explain sleepers. Mention their functions. Also write down the material we can use for sleepers with their advantages and disadvantages.
Q.1  
   a) Write the various expressions used to determine the fire demand.  
   b) Explain fluoridation.  
   c) What do you understand by break point chlorination?  
   d) Give an expression for uniformity coefficient of sand. What is the effective size of filter sand? 
   e) Give the permissible limits for the following in drinking water:  
      i) Fluorides 
      ii) Iron 
      iii) pH 
      iv) Total solids 
   f) Explain the advantages of cast iron pipes.  
   g) What do you understand by water softening?  
   h) What is the necessity of pumping?  
   i) Differentiate between rapid sand and slow sand filters (2 main points).  
   j) Explain the term aeration with an example.  

**PART-A**

Q.2  
   a) Write a note on variations in rate of demand. Explain clearly how would you take into account these variations in the design of various units?  

Q.3  
   a) Explain various chemical characteristics of drinking water. Also elaborate the tests carried out for their determination (any three).  
   b) A waste water from a factory having pH=8.5 contains KOH only. Find the total quantity of KOH per day if the waste water discharge is 90 m$^3$/day.  
   c) Find out the pH of the mixture of the following two solutions:  
      Solution A: Volume= 450 ml, pH=5  
      Solution B: Volume= 550 ml, pH=?  

Q.4  
   a) Two million litres of water per day is passing through a sedimentation tank which is 7 m wide, 15 m long and having a water depth of 3.5 m. Find:  
      i) Detention time  
      ii) Average flow velocity  
      iii) The overflow rate  
   b) Describe with the help of sketches, a slow sand filter. Explain its working.
PART-B

Q.5  
   a) Write a short note on activated carbon treatment. Also explain lime soda process used for water softening.  
   b) A sample of raw water contains 300 mg/l of CaCO₃, 55 mg/l hardness as MgSO₄, 60 mg/l hardness as CaCl₂ and 100 mg/l hardness as CaSO₄. Compute the quantities of lime and soda required to treat 1 million litres of water.  

Q.6  
   a) Explain different methods of distribution system. Which method do you prefer?  
   b) State the comparative merits and demerits of the following materials used in conveyance of water:  
      i) Cast iron  
      ii) Steel  
      iii) Concrete pipes  
   c) What are the different criteria for the site selection of a pumping station?  

Q.7  
   a) Discuss with help of diagrams, the various methods of laying out the distribution system. Also mention their advantages and disadvantages.  
   b) What are the different systems of water supply? Explain.  
   c) Explain the types of storage and distribution reservoirs with suitable diagrams.
End Semester Examination, May 2014  
B. Tech. – Fifth Semester  
WATER SUPPLY AND TREATMENT PLANT (C-502)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
1. a) Write the various expressions used to determine the fire demand.  
b) Explain fluoridation.  
c) What do you understand by break point chlorination?  
d) Give an expression for uniformity coefficient of sand. What is the effective size of filter sand?  
e) Give the permissible limits for the following in drinking water:  
i) Fluorides
ii) Iron
iii) pH
iv) Total solids  
f) Explain the advantages of cast iron pipes.  
g) What do you understand by water softening?  
h) What is the necessity of pumping?  
i) Differentiate between rapid sand and slow sand filters (2 main points).  
j) Explain the term aeration with an example.  

PART-A

Q.2  
a) Write a note on variations in rate of demand. Explain clearly how would you take into account these variations in the design of various units?  
b) In two periods, each of 20 years, a city population grew from 30,000 to 172,000 to 292,000. Find:  
i) Saturation population  
ii) The coefficients of logistic equation  
iii) Expected population in the next 20 years

Q.3  
a) Explain various chemical characteristics of drinking water. Also elaborate the tests carried out for their determination (any three).  
b) A waste water from a factory having pH=8.5 contains KOH only. Find the total quantity of KOH per day if the waste water discharge is 90 m$^3$/day.  
c) Find out the pH of the mixture of the following two solutions:  
Solution A: Volume= 450 ml, pH=5  
Solution B: Volume= 550 ml, pH=7

Q.4  
a) Two million litres of water per day is passing through a sedimentation tank which is 7 m wide, 15 m long and having a water depth of 3.5 m. Find:  
i) Detention time  
ii) Average flow velocity  
iii) The overflow rate  
b) Describe with the help of sketches, a slow sand filter. Explain its working.

P. T. O.
End Semester Examination, May 2014
B. Tech. – Fifth Semester
IRRIGATION ENGINEERING-I (C-503)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:
a) Necessity of providing a fall  
b) Utility of a weir.  
c) Role of a cross-regulator. Give sketch. 
d) Merits of an arch dam.  
e) Functions of a divide wall in a weir.  
f) Exit gradient.  
g) Role of ski-jump bucket.  
h) Failure by piping in case of foundation of a weir.  
i) Mode of energy dissipation in Sarda Fall.  
j) Utility of a fish ladder in a weir.  

2x10

PART-A

Q.2 a) Describe with sketches the considerations for best alignment of off-take of a branch canal or a distributary.  

6

b) Discuss role of head-regulator and cross-regulator in a branch canal off-take from the main canal. Give a neat sketch of the head-regulator.  

7

c) Draw a neat sketch of a weir across a river showing clearly different components like undersluices, guide banks, fish ladder, divide wall and the head-regulator. Give functions of head-regulator and how do we fix the crest level.  

7

Q.3 a) Define a cross-drainage work. Differentiate between aqueduct and syphon aqueduct with neat sketches. How can we substitute the syphon aqueduct with aqueduct by changing the alignment of the canal.  

10

b) Design a syphon-aqueduct with following data:
   i) Discharge of tributary = 850 m$^3$/s  
   ii) Highest flood level = 321.50 m  
   iii) Bed level = 227.50 m  
   iv) General ground level = 230.0 m  
   v) Bed level of canal = 230.0 m  
   vi) Slab thickness = 0.30 m  
   vii) Number of spans = 15

Calculate the following:
   i) Afflux  
   ii) Waterway  
   iii) Clear water way  
   iv) Head loss in the barrel  
   v) Uplift-pressure on the ceiling of canal slab/bed.

10

Draw a proper sketch showing above levels.

Q.4 a) Differentiate between a streamline and equipotential line. Give a neat sketch of this network in case of a weir foundation with three cutoff walls.  

4

b) What is a hydraulic gradient line? Prove that: 

$$t = \frac{h^2 - t}{G - 1}$$

by giving a proper sketch.  

4

c) Find out the correct values of $\phi$ at different points after applying corrections for floor thickness and interference of adjoining piles for the sketch given below.

P. T. O
Q.5 a) Give the merits and demerits of concrete and earth dams. 4
b) What is middle third rule? Explain with equations. 4
c) Calculate the bearing pressure at the heel and toe of the concrete dam sketched below.

Q.6 a) What is a spillway and define its rise in case of a storage dam. Derive the expression \( l_2 - l_1 = \frac{A}{O - kh^{1/2}} \). 8
b) Design the profile of an ogee spillway with the following data:
   i) \( Q = 8500 \text{ m}^3/\text{s} \)
   ii) No. of piers = 5, No. of spans = 6
       Length of each span = 10 m, \( k_p = 0.01 \), \( k_u = 0.1 \), equation of \( d/s \)
       profile = \( x^{+5} = 2(H_e)^{+5} \times y \), Slope of spillway after the curved portion = 0.75:1.
       Calculate \( H_e \) = height of watershed over the crest. Values of \( y \) for
       \( x = 5, 10, 15, 20 \) and 22.4. 12

Q.7 a) Explain how do we draw the tail water rating curves and jump height curves in case of a dam apron across a river. 10
b) Describe the utility of a U.S.B.R. stilling basin. Also give the correlation between the Froude number and length of the basin. Support your answer with a neat sketch. 10
End Semester Examination, May 2014
B. Tech. – Fifth Semester
BRIDGE ENGINEERING (C-504)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
   a) Define bridge.
   b) What do you mean by width of carriageway?
   c) Define pier and wing wall.
   d) Define scour depth.
   e) How do you classify a bridge?
   f) List the various loads acting on a road bridge.
   g) Name the types of joints in a bridge.
   h) Draw the various shapes of a well foundation.
   i) What is an arch bridge?
   j) List the essential data that are to be collected for the design of a bridge. 2x10

**PART-A**

Q.2 a) What do you mean by economic span? Derive an expression for determining the economical span. 7
   b) Explain the various components of a bridge with a neat sketch. 7
   c) Write short notes on:
      i) Centrifugal force.
      ii) Impact effect. 6

Q.3 a) Explain in detail, IRC class AA loading with sketches. 7
   b) Explain IRC class 70 R loading in detail with sketches. 7
   c) Write short notes on:
      i) Centrifugal force.
      ii) Impact effect. 6

Q.4 a) Explain various types of R.C.C Bridges with neat sketches. 8
   b) Design the deck slab of an R.C.C culvert by determining the dead and live load bending moment with the following data:
      Carriageway width =7.5 m
      Clear span =8 m
      Wearing coat =80 m
      Width of bearing =400 mm
      Footpath =1 m on either side
      Materials =M-25 Grade of concrete and Fe-415 HYSD bars. Assume the necessary data. 12

**PART-B**

Q.5 a) Explain any two types of steel bridges in detail with neat sketches. 10
   b) Design a steel beam culvert with a clear span of 5 m to carry a broad gauge single track on main line. Assume the necessary data. 10

P. T. O.
Q.6  a) What is an abutment? What are the forces that are to be considered while designing an abutment? 5
    b) Why bearing are provided in a bridge? 5
    c) Design a pier for the following data:
       Super structure: simply supported T-beam of 21 m span.
       Foundation: Well foundation
       Dead load from each span= 2300 kN.
       Reaction due to live load on one span=900 kN
       Maximum mean velocity of current =3.6 m/s
       Material for pier=M20 grade of concrete
       Consider IRC Class AA loading for live load only the straight portion is to be considered in the design.
       Pier dimension is shown in the figure.

    ![Dimension of Pier Diagram]

    FIG :  DIMENSION OF PIER
    (ALL DIMENSIONS ARE IN MM)
    10

Q.7  a) What is a well foundation? Explain various components of well foundation in detail with a neat sketch. 8
    b) Explain pile foundation in detail. 6
    c) Explain the design procedure of a well foundation. 6
<table>
<thead>
<tr>
<th>L</th>
<th>CDA for Bending Moment and Shear</th>
<th>Modified BG Loading – 1987</th>
<th>Modified MG Loading – 1988</th>
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# TABLE 7

**SINGLE JOIST WITH CHANNEL AND PLATES ON THE FLANGES TO BE USED AS GIRDERS**

<table>
<thead>
<tr>
<th>Joist Designation</th>
<th>Top Flange</th>
<th>Bottom Flange</th>
<th>Width x Thickness</th>
<th>Weight per Metre</th>
<th>Sectional Area</th>
<th>Centre of Gravity</th>
<th>Mean Thickness of Flanges</th>
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### TABLE 7 (Cont'd.)

**SINGLE JOIST WITH CHANNEL AND PLATES ON THE FLANGES TO BE USED AS GIRDERS**

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<th>Extreme Fibre Distances</th>
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TABLE 7 (Contd.)

SINGLE JOIST WITH CHANNEL AND PLATES ON THE FLANGES TO BE USED AS GIRDERS

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24
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SINGLE JOIST WITH CHANNEL AND PLATES ON THE FLANGES TO BE USED AS GIRDER

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(Continued)
End Semester Examination, May 2014
B. Tech. – Fifth Semester
INFORMATION STORAGE AND MANAGEMENT (CS-501)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory.** Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B.** Each question carries equal marks.

Q.1 Answer in brief:
   a) Define HBA (Host Bus Adapter).
   b) Write down the difference between unstructured data and structured data.
   c) Define storage virtualization.
   d) Write the difference between RAID3 and RAID4.
   e) Define Hot sparing method.
   f) Define FCIP.
   g) What is information availability?
   h) Write down the difference between risk traid and assets.
   i) Write down the difference between recovery and archive.
   j) Define Storage security framework.

   2x10

**PART-A**

Q.2 a) What are the key requirements of data centre elements? 10
   b) Describe the benefits of ILM implementation. Explain briefly ILM implementation. 10

Q.3 a) Describe the physical components of connectivity. 10
   b) Describe the difference between software and hardware RAID. 10

Q.4 a) Explain CAS (Content addressed storage) in detail. 10
   b) Write short notes on:
      i) ISCSI 10
      ii) Architecture of NAS 10

   5x2

**PART-B**

Q.5 a) Discuss business continuity planning life cycle. 10
   b) Write down the difference between synchronous and asynchronous replica. 10

Q.6 a) Explain the monitoring parameters. 10
   b) Discuss the SNMP protocols. 10

Q.7 a) Explain the threat against BURA. 10
   b) What are the security threat in management access domain? 10
End Semester Examination, May 2014
B. Tech. – Fifth Semester
COMPUTER GRAPHICS (CS-502)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1   a) Define the terms: persistence and resolution.
      b) What is the difference between raster and random scan methods?
      c) What is the need for homogeneous co-ordinates?
      d) What is 2D-viewing pipeline?
      e) Differentiate between cavalier and cabinet projections.
      f) Write the matrix for scaling of 3D objects.
      g) What is the hidden surface removal? Why do we need to remove hidden surfaces?
      h) What are polygon meshes?
      i) Define transparency and shadow.
      j) What is 8-point symmetry of a circle? 2x10

PART-A

Q.2   a) What is computer graphics? Write applications of computer graphics.
      b) Differentiate between boundary-fill and flood-fill algorithms.
      c) Derive and explain Bresenham’s algorithm for line drawing. Scan convert a line
         from (1, 1) to (8, 5) using Bresenham’s line drawing algorithm. 12

Q.3   a) Derive the matrix for rotation of 2D object about a point.
      b) Explain Cohen-Sutherland algorithm for line clipping. Let R be a rectangular
         window whose lower-left hand corner is at (-3, 1) and upper-right hand corner is
         at (2, 6). Use the Cohen-Sutherland algorithm to clip the line segments AB, CD
         with the following co-ordinates:
         \[ A = (-4, 7), \quad B = (-2, 10), \]
         \[ C = (-1, 5), \quad D = (3, 8), \]
         \[ E = (-2, 3), \quad F = (1.2) \]

Q.4   a) What is vanishing point in projections?
      b) Differentiate between parallel and perspective projections.
      c) How do we perform rotation of 3D-objects? Write the matrix representation also. 10

PART-B

Q.5   a) Differentiate between image space algorithms and object space algorithms for
      hidden surface removal.
      b) Explain in detail area subdivision algorithms for hidden surface removal. How a
         z-buffer algorithm is used in area-subdivision algorithm?
      c) Write scanline algorithm for hidden surface removal. 10

Q.6   a) What are Bezier and B-spline curves? Write the properties of Bezier and B-spline
      curves.
      b) What is Hermite blending function? How will you represent a curve using Hermite
         interpolation methods?

Q.7   a) What is illumination model? Derive an expression for calculating the light
      intensities using the illumination model.
      b) What is image filtering and image processing?
      c) Explain phony shading model in detail.
End Semester Examination, May 2014
B.Tech. – Fifth Semester
COMPONENT BASED PROGRAMMING TECHNOLOGY (CS-503)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain the output of the following patch of code:
   i) String S1=“Learn”;
      S1=S1.Insert (3,“p”);
      Console.WriteLine (S1);
   ii) String S2=“DELHI”;
      String S3=S2.Substring (3);
      Console.WriteLine (S3);
   b) How source code is converted into native machine code in DOTNET? 3
   c) What are jagged arrays? 3
   d) Name the applications that can be developed under DOTNET framework. 2
   e) What are Collection classes in DOTNET? 3
   f) What do you understand by data reader and data set objects? 3
   g) Write down the importance of static functions. 3

   PART-A

Q.2 a) What is type conversion? Is unboxing an explicit conversion? Justify your answer. 4
   b) What is a value and reference data type in C#? Explain in detail. 6
   c) Explain mutable and immutable strings with the help of an example. 10

Q.3 a) Why there’s a need of exception handling? What is the significance of use ‘Try’, ‘Catch’ and finally block? 10
   b) Differentiate between array and array list. Give example of array list implementation. 10

Q.4 a) Explain in context of DOTNET:
   i) CLS  ii) CTS  iii) MSIL  iv) JIT 15
   b) How Garbage collection is implementation in C#? 5

   PART-B

Q.5 a) Using Windows Forms, how you can implement simple calculator having sum, multiply, subtraction and division functionality. 8
   b) Make a Window form application to calculate prime number and factorial of a number. Use three forms: one main form, second form to calculate factorial and third form to calculate prime number. 12

Q.6 a) What are the advantages of connectionless data models? Explain. 3
   b) Explain ADO.NET architecture with the help of a diagram. 10
   c) Explain simple and complex data binding. 7

Q.7 a) What are .NET assemblies? How are they implemented in C#? 10
   b) Explain the security architecture of DOTNET in context of web applications. 10
End Semester Examination, May 2014  
B. Tech. – Fifth Semester  
DISTRIBUTED OPERATING SYSTEMS (CS-825)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define the term: distributed system. What are disadvantages of these system?  
b) Differentiate between write through and write back cache protocol.  
c) Justify the statement “The microkernel is more flexible because it does almost nothing”.  
d) What is parameter marshaling? State the condition where it is used.  
e) Define atomic transaction. Also mention the essential properties for it.  
f) What are immutable files? What are benefits of using them?  
g) What are disadvantages of ring algorithm vis-a-vis bully algorithm?  
h) How are NUMA multiprocessors different from UMA multiprocessors?  
i) Is there any difference between threads and process? If yes, state.  
j) What is MACH process? Define the ports it uses.  

PART-A

Q.2  
a) While designing a distributed operating system, what were the key issues that are taken care of by a designer?  

Q.3  
a) Distributed algorithm requires one process to act as co-ordinator. If co-ordinator fails, how is the situation handled in distributed system? State the algorithm, basic idea and working principle for both algorithms used.  
b) Explain all three methods that are used to implement atomic transaction in a distributed system.

Q.4  
a) What are threads and thread packages? How is a thread package implemented?  
b) What are ways of organizing multiple processors in a distributed system? Explain each with help of a neat diagram.

PART-B

Q.5  
a) How is file service using the upload / download model different from remote access model?  
b) What are the semantics of file sharing in a distributed file system design? Explain briefly.  
c) State the names of algorithms for managing a client file cache.

Q.6  
a) What is shared memory? What are various kinds of shared memory systems? Explain any two of these in detail.  
b) 'Consistency model is essentially a contract between the software and the memory'. Why does one need a contract like this? Define at least two such models in detail.

Q.7  
a) How are messages sent and received in MACH operating system? Explain; also give the Mach message format.  
b) Write short notes on any two of the following:  
   i) Implementation of C threads in MACH.  
   ii) Capabilities used in MACH communication.  
   iii) Unix emulation in MACH.
End Semester Examination, May 2014
B. Tech. – Fifth Semester
MICROPROCESSORS AND INTERFACING (EC-401 / EC-401A)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer any ten:
   a) Write down the names of interrupt lines as per their priority assigned in an 8085?
   b) How direct addressing is different from immediate addressing in an 8085?
   c) What will be the status of carry flag and accumulator after the following sequence of instruction?
      STC
      CMC
      MVI A, 87H
      RRC
d) Explain the function of ALE and NMI signals of an 8086.
   e) Name the segment registers of an 8086.
   f) Assume (CL) = 02H, (AX) = 2345H. Determine the new contents of AX and carry flag after execution of SAL AX, CL.
   g) Find the last address of 8 K memory chip, if address of its first location is 3000 H.
   h) Write control word for an 8255 for BSR mode to set bits PCO, PC5 and PC7.
   i) Write down two assembler directives of an 8086 and explain their functions.
   j) What do you understand by the process “DMA”?
   k) What is the function of priority resolver in PIC 8259?
   l) Explain the format of ICW1 in an 8253.

   2x10

PART-A

Q.2 a) Explain the function of program counter, accumulator, HL pair and stack pointer in an 8085.
     b) State the function performed and addressing mode used for the following instructions of an 8085:
        i) STA 3200    ii) JZ 2300 H
        iii) LDAX H    iv) LHLD 2550 H

     3x4

Q.3 a) How physical address is generated in an 8086? Explain with example.
     b) Explain the interrupt structure of an 8086.
     c) Describe all the unique signals used in an 8086 for its maximum mode configuration.

     4 10 6

Q.4 a) What are the different addressing modes used for an 8086? Explain any three addressing modes by giving suitable examples.
     b) Describe the function performed by the following instructions of an 8086:
        i) MOVSW
        ii) XLAT
        iii) RCR AX, CL
        iv) CLI

     12 2x4

PART-B

Q.5 a) Draw the block diagram showing RAM interfacing with microprocessor and mention the purpose of each and every signal used therein for interfacing.

     7

P. T. O.
b) Compare memory mapped I/O and peripheral mapped I/O address schemes.  

c) How can you select 8 blocks of addresses each of 4 kB area using a decoder IC?  
   Draw the arrangement showing all required signals.  

Q.6  
   a) What are the various data transfer scheme possible between I/O devices and  
       microprocessor? Explain interrupt driven data transfer scheme.  
   b) Describe the various modes of operation of an 8255. How the control word of an  
       8255 is formatted for different modes? Explain.  

Q.7  
   a) Explain the control word format of an 8253.  
   b) Draw the functional block diagram of PIC 8259 and describe the various blocks of  
       its interrupt and control logic section.  
   c) What are the functions of the following registers of DMA controller 8237?  
      i) Command register.  
      ii) Base word count register.  
      iii) Current address registers.  
      iv) Mask register.
End Semester Examination, May 2014
B. Tech. – Fifth Semester
ANTENNA AND WAVE PROPAGATION (EC-501)

Time: 3 hrs

Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is the impedance of free space?
b) What is driven element in an antenna?
c) What is the gain of an isotropic antenna?
d) What is critical frequency?
e) What is a linear array?
f) What is the expression for MUF?
g) What is zoning in a dielectric antenna? What is its purpose?
h) What type of antenna is used as a standard reference antenna?
i) What is the relationship between antenna directivity and beam width?
j) What is the relationship between refractive index of ionosphere with frequency?

2x10

PART-A

Q.2
Explain the following terms:
a) Directivity and gain.
b) Radiation pattern.
c) Antenna bandwidth.
d) Antenna efficiency.

5x4

Q.3
a) Define radiation resistance of an antenna. Show that radiation resistance of a half wave dipole is 73 Ω.
b) Find the maximum effective aperture of an antenna when it is operating at a wavelength of 2 m and directivity of 100.

10

Q.4
a) Explain the construction and working principle of Yagi-Uda antenna. What are its characteristics and uses?
b) What is a frequency independent antenna? What is the operating principle of log periodic dipole antenna? What are its characteristics and applications?

10

PART-B

Q.5
a) Derive an equation for the far field pattern of two isotropic point sources of same amplitude and phase.
b) Calculate the directivity of a given broadside uniform array of 10 isotropic elements with a separation of \( \frac{\lambda}{4} \) between the elements.

10

Q.6
a) Explain the principle of operation of a parabolic reflectors antenna. What are its design features? What is the feed arrangement for this antenna?
b) What is a horn antenna? Explain its various types.

10

Q.7
a) What is duct propagation? Where is it used? Briefly discuss.
b) Define maximum usable frequency (MUF) and derive an expression for the same in the case of a thin ionospheric layer over plane earth.

10
End Semester Examination, May 2014  
B. Tech. – Fifth Semester  
ANTENNA AND WAVE PROPAGATION (EC-501A)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Is the isotropic and omni-directional radiator same or different? Show the required pattern with justification.  
b) How Smith chart is useful for antenna design? Explain with a proper example.  
c) What are the differences between standing wave antennas and traveling wave antennas? Give an example.  
d) What is the refractive index of the ionosphere? Show that the refractive index of the ionosphere is less than one whereas that of un-ionized medium is one.  
e) What is the phase difference between antenna elements in 2-elements end fire array?  

PART-A  

Q.2 a) A small circular copper loop antenna has mean loop circumference of 0.2 λ, wire radius 0.001 λ. Find the radiation resistance, input impedance and radiation efficiency for excitation at 1 MHz. Given σ = 5.7 × 10^7 mho/m.  
b) Explain in detail the various potentials used in antenna theory. Also derive an expression for retarded vector and scalar potential.  

Q.3 a) An antenna transmitting 50 Watts of power, with a gain of 3 dB in the direction of a receive antenna with a gain of 3 dB. Suppose the antennas are separated by 20,000 km. The GPS satellites operate at a frequency of 1.575 GHz. How much power is received in dB?  
b) The electric field of a plane wave is represented by \( E = \hat{\phi} 10^4 \cos(10^6 t + 30\phi) \text{V/m} \). Determine the i) magnetic field H, ii) phase velocity and iii) dielectric constant of the medium, where \( \mu = \mu_0 \).  
c) An antenna having an effective temperature of 15 K is fed into a microwave amplifier that has an effective noise temperature of 20 K. Calculate the available noise power per unit bandwidth at the input for this particular antenna temperature. Calculate the available noise power for a noise bandwidth of 4 MHz. Assume \( k = 1.38 \times 10^{-23} \).  
d) Electric field of a linearly polarized EM-wave is given by \( E_z = \hat{\phi} E_0(x, y)e^{-j\omega t} \) is incident upon a linearly polarized antenna whose electric field polarization can be expressed as \( E_x = (\hat{\phi} + \hat{\theta}) E(r, \theta, \phi) \). Find the polarization loss factor (PLF).  

Q.4 a) Derive scalar wave equation in terms of EM potential (V).  
b) Explain the following terms:  
i) Directive gain and power gain  
ii) Antenna bandwidth and fractional bandwidth  
iii) Friis transmission formula  
iv) Polarization of antennas  

P. T. O.
**PART-B**

Q.5  
a) Discuss methods and techniques for measuring:
   i) The polarization of an antenna
   ii) The impedance of an antenna

  b) Design a four-element linear binomial array on y-axis for uniform inter-elements spacing of half wavelength. Plot the array pattern. Find FNBW.  

  **5x2**

Q.6  
a) Explain the formation of an inversion layer in the troposphere and the phenomenon of duct propagation. Explain the factors that help in the formation of the duct.

  b) Explain conditions of total reflections of radio waves from the ionosphere. Also find out an expression for the skip distance (D) for a given frequency.  

  **10**

Q.7  
a) A high frequency radio link has to be established between two points on the earth 20 km away. The reflection region of the ionosphere is at a height of 200 km and has a critical frequency of 6 MHz. Calculate the MUF for the given path.

  b) A vertically polarized plane wave of power density 10 W/m² propagates at 2 MHz as surface wave along smooth surface of the earth having dielectric constant 16 and conductivity $10^{-5}$ mho/m. Find the wave tilt and the power loss per m² of the ground.

  c) Explain the following terms:
      i) Critical frequency
      ii) LUF
      iii) MUF
      iv) Skip distance
      v) Modes of Propagation

  **10**
End Semester Examination, May 2014
B. Tech. – Fifth Semester
DIGITAL SIGNAL PROCESSING (EC-502 / EC-502A)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is twiddle factor? Prove its periodic property.
b) Write down an expression for Hanning window function.
c) What is interpolation?
d) Calculate linear convolution between \( x(n) = [1,2,3] \) and \( h(n) = [0,1,2] \).
e) Write applications of multirate digital signal processing.
f) State sampling theorem.
g) What is ROC?
h) What do you mean by linear phase filter?
i) What is mapping?
j) Calculate \( x(z) \), if \( x(n) = \delta(n+1) + 3\delta(n) - 6\delta(n-3) + \delta(n-4) \).

2x10

PART-A

Q.2  a) Determine \( x(n) \), if \( x(z) = \frac{z^2 + 2}{2z^2 - 7z + 3} \) when ROC is given as i) \( |z| > 3 \) ii) \( |z| < \frac{1}{2} \).

b) Find \( x(n) \) by using convolution property of z-transform when \( x(n) = [1,2,3,1,-1,1] \) and \( h(n) = [1,1,1] \).

10

Q.3  a) Determine IDFT of \( x(k) = [3,2+\imath,1,2-\imath] \).
b) Determine 4-pt DFT of \( x(n) = \cos \frac{n\pi}{4} \).

10

Q.4  a) Calculate DIT FFT of \( x(n) = [1,1,1,0,0,1,1,1] \).
b) Compute circular convolution of \( x(n) = [1,2,3,1] \) and \( h(n) = [4,3,2,2] \).

10

PART-B

Q.5  a) Explain Fourier series method for designing of FIR filter.
b) A filter is to be designed with following desired frequency response

\[
H_d(e^{j\omega}) = \begin{cases} 
0, & -\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4} \\
\frac{e^{-j2\omega}}{e^{-j2\pi}}, & \frac{\pi}{4} < |\omega| < \pi
\end{cases}
\]

Determine filter coefficients \( h_j(n) \) if the window function is defined as

\[
\omega(n) = \begin{cases} 
1, & \text{if } n \text{ is exact} \\
0, & \text{otherwise}
\end{cases}
\]

Also determine the frequency response \( H(e^{j\omega}) \) of the designed filter.

10

Q.6  a) Obtain mapping formula and mapping graph for bilinear transformation.
b) Describe Chebyshev filter.

10

Q.7  a) Explain the process of sampling rate conversion using decimation and interpolation.
b) Explain how to alter sampling rate by a fraction.

10
End Semester Examination, May 2014
B. Tech. – Fifth Semester
DIGITAL SYSTEM DESIGN (EC-503 / EC-503A)

Time: 3 hrs                Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Draw flow chart of VHDL design flow.
b) What do you mean by operator overloading?
c) Explain WAIT statement.
d) Perform -7 rem 4.
e) Perform 01100101 slt -3
f) What do you mean by generics?
g) What do you mean by component instantiation?
h) What are the advantages of using hardware description language as compared to schematic capture in the design process?
i) What purpose does HDL serve in digital system design?
j) Write an entity description for shift register. 2x10

PART-A

Q.2 a) Differentiate between concurrent and sequential statements with an example. 10
b) What are various data objects? Explain. 10

Q.3 a) What do you mean by component declaration? Explain structural modeling with a suitable example. 10
b) Write down complete VHDL model for full adder in data flow and behavioural modeling. 10

Q.4 a) Write VHDL code for decimal to BCD encoder. 10
b) Write VHDL code for 9-bit parity generator. 10

PART-B

Q.5 a) Write VHDL code for S-R flip-flop in behavioural modeling. 10
b) Write data flow model for 4-bit serial in parallel out register. 10

Q.6 a) Implement 16-bit ALU using VHDL model. 10
b) Implement simple microcomputer system using VHDL. 10

Q.7 Explain any two of the following:
a) FPGA 10x2
b) GAL

c) PAL
End Semester Examination, May 2014
B. Tech. – Fifth Semester
COMMUNICATION ENGINEERING (EC-504)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) State sampling theorem. Given the signal \( m(t) = 10 \cos^2 200\pi t \), what is the minimum sampling rate based on the low pass uniform sampling theorem.
   b) What is companding? Why is it used?
   c) What is difference between binary and M-ary signaling scheme? What are the advantages of M-ary signaling?
   d) Explain binary FSK modulation scheme.
   e) What is matched filter? Write the equation for probability of error for matched filter.
   f) Give the signal space characterization of QPSK signal.
   g) Find the differential entropy \( H(x) \) of the uniformly distributed random variable \( x \) with probability density function \( f_x(x) = \begin{cases} \frac{1}{4}, & |x| < \frac{1}{4} \\ 0, & \text{otherwise} \end{cases} \).
   h) An analog signal is bandlimited to 10 Hz, sampled at the Nyquist rate and the samples are quantized into 4 levels. The quantization levels \( Q_1, Q_2, Q_3 \) and \( Q_4 \) are assumed independent and occur with probabilities \( P_1 = P_2 = \frac{1}{8} \) and \( P_3 = P_4 = \frac{3}{8} \). Find the information rate of the source.
   i) What is near-far effect in CDMA system?
   j) Prove the following identity:
   \[
   H(x, y) = H(x/y) + H(y)
   \]

PART-A

Q.2  a) Explain pulse code modulation. Derive the relation for signaling rate and transmission bandwidth in a PCM system.
   b) With the help of a block diagram, explain in detail differential pulse code modulation (DPCM) system. What is the need of predictor in DPCM?

Q.3  a) Explain the working of MSK scheme. Why is it called minimum shift keying? How the phase continuity is achieved in this technique?
   b) What is the working principle of OFDM technique? How this scheme overcomes multipath related impairments?

Q.4  a) What is an optimum filter? Derive an expression for probability of error of an optimum filter.
   b) Explain the functioning of correlator and do the comparative study between correlator and matched filter.

PART-B

Q.5  a) Derive the expression for probability of error for M-ary PSK system using signal space representation.
   b) Compare the performance of PSK, FSK and ASK system.

P. T. O.
Q.6  a) For a television transmission, the required number of brightness levels=16, pixels per picture frame=10⁶, frames transmitted per second=30 and SNR=30dB. Find minimum bandwidth required.  
   b) Five source messages are probable to appear as:
       \( m_1 = 0.4, m_2 = 0.15, m_3 = 0.15, m_4 = 0.15, m_5 = 0.15 \). Find coding efficiency for:
       i) Shannon-Fano coding  
       ii) Huffman coding
   c) Find channel capacity of a binary symmetric channel.  

Q.7  a) Define spread spectrum and its goal. List the two spread spectrum techniques and explain any one of them in detail.  
   b) How PN sequences are generated? What are its characteristics?
End Semester Examination, May 2014
B. Tech. – Fifth Semester
WIRELESS COMMUNICATION (EC-506)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is frequency band of a GSM system?  2
     b) Differentiate between FDD and TDD.  4
     c) What is difference between diffraction and scattering in radio propagation?  4
     d) What is the frequency used in blue tooth?  2
     e) What is the difference between GPRS and GPS?  4
     f) What is the difference between co-channel and adjacent channel?  4

PART-A

Q.2  a) Draw a labeled block diagram for evaluation of mobile wireless communication systems from 1G to 3G.  10
     b) What are control channels in a GSM system? Explain their applications.  10

Q.3  a) Explain frequency reuse. Why seven segment cluster of cell is the best?  10
     b) Find the frequency reuse factor and the cluster size that should be used for maximum capacity for path loss exponent a) n=4, b) n=3. The signal to interference ratio of 15 dB is minimum required for satisfactory performance. There are 6 co-channel cells in first tier at equal distance from the mobile.  10

Q.4  a) Explain fading effects due to doppler spread.  10
     b) Find the Fraunhofer distance for an antenna with maximum dimension of 1 m and operating frequency of 900 MHz. If antennas have unity gain, calculate the path loss.  10

PART-B

Q.5  a) Explain linear equalization and drive the output of equalizer.  10
     b) What are diversity techniques? Explain with a diagram.  10

Q.6  a) Write short notes on:
     i) ALOHA and its derivation.  10
     ii) FHMA.
     b) Determine the number of analog channels per cell with propagation path loss n=3 when the minimum acceptable C/I = 14 dB. What is appropriate cluster size for the system? Assume the channel bandwidth is 30 kHz and total spectrum allocation is 20 MHz.  10

Q.7  a) Explain difference between FDMA, TDMA and CDMA.  10
     b) Explain hand off strategies.  10
End Semester Examination, May 2014
B. Tech. – Fifth Semester
CONTROL SYSTEM ENGINEERING (EE-501 / EE-501A)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
a) Compare an open loop and a closed loop system.
b) What do you mean by type 2 systems?
c) What is gain cross-over frequency?
d) Define peak time of a second order system.
e) Define bounded input bounded output stability.
f) What is phase margin?
g) Draw an electrical network for lag compensation.
h) What are synchrons?
i) Draw the polar plot of transfer function \( K_s \left( 1 + sT_1 \right) \left( 1 + sT_2 \right) \).
j) What do you mean by a PID controller?

2x10

Q.2 a) Obtain the overall transfer function \( \frac{C}{R} \) of the signal flow graph shown below using Mason's gain formula.

\[
\begin{align*}
\text{Diagram with signal flow graph.}
\end{align*}
\]

b) Derive the transfer function of a field controlled dc motor.

10

Q.3 a) Explain the time domain specifications for an under-damped second order system with unit step input.
b) Determine the error constants of the system with the open loop transfer function
\[
G(s) H(s) = \frac{15}{(s + 2)(s^2 + 2s + 10)}.
\]
Find also the steady state error for a unit step input.

10

Q.4 a) Explain Routh Hurwitz criterion. Using this criterion, find the stability of characteristic equation given as
\[
2s^5 + s^4 + 2s^3 + 4s^2 + s + 6 = 0.
\]

10

P. T. O.
b) The open loop transfer function of a closed loop system is
\[ G(s)H(s) = \frac{K}{s(s + 4)(s^2 + 4s + 20)} \]. Draw the root locus as K is varied from 0 to \( \infty \).

**PART-B**

Q.5  a) A unity feedback control system has \( G(s) = \frac{4}{s(s + 5)(s + 10)} \). Draw the Bode plot and obtain the gain margin and phase margin.

b) State and explain Nyquist stability criterion.

Q.6  Write short notes on *any two*:
   a) Stepper motor and its applications.
   b) AC servomotor.
   c) Magnetic amplifier.

Q.7  a) Realize a phase lead compensation network, derive its transfer function and draw its Bode plot.

b) Obtain the state space representation for a system characterized by the differential equation
\[ \frac{d^2 y}{dt^2} + 8 \frac{d^3 y}{dt^3} + 5 \frac{dy}{dt} + 7y = 9u(t), \]
where \( y \) is the output and \( u \) is the input to the system.
End Semester Examination, May 2014
B. Tech. – Fourth / Fifth Semester
POWER ELECTRONICS (EE-502)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Draw v-i characteristic of an S.C.R.
b) Define latching current.
c) What is function of freewheeling diodes?
d) What is snubber circuit?
e) What are circulating currents?
f) Draw the circuit of a type D chopper.
g) What is time ratio control (TRC) in choppers?
h) What is meant by phase control?
i) What is the basic principle of an inverter?
j) Draw the symbols for i) DIAC ii) TRIAC.

PART-A

Q.2 a) What are various methods to turn on S.C.R.?
b) What are various types of commutation? Explain any one type of forced commutation in detail with waveforms.

Q.3 a) Explain the construction details and working of MOSFET.
b) Explain the types of power diodes.

Q.4 a) Describe the working of single phase full-wave converter feeding with RLE load. Draw the waveforms required.
b) Explain the working of a dual converter. What are the causes of circulating currents?

PART-B

Q.5 a) Discuss the principle of working of 3-phase bridge inverter with 120 degree mode of operation.
b) What is difference between voltage source inverter and current source inverter?

Q.6 a) Explain the working of a single phase to single phase step-up cycloconverter with circuit diagram and waveforms.
b) Explain with waveforms working of AC voltage regulator with R load.

Q.7 a) Describe the principle of step-up chopper. Derive an expression for average output voltage.
b) Explain in detail working of a four-quadrant chopper (type E).
End Semester Examination, May 2014  
B. Tech. – Fifth Semester  
ELECTRICAL MACHINE DESIGN (EE-503)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define specific electrical loading.  
b) State any two guiding factors for the choice of number of poles.  
c) Define window space factor.  
d) Define short circuit ratio of a synchronous machine.  
e) What type of slots are preferred in an induction motor?  
f) List the undesirable effects produced by certain combinations of rotor and stator slots.  
g) What is function of damper winding?  
h) Give difference between fringing flux and leakage flux.  
i) Write an expression for length of mean turn of stator winding.  
j) How is computer design different from conventional design in case of electrical machines?  

2x10

PART-A

Q.2  
a) Derive an expression for cooling of electrical machines.  
b) Discuss advantage of hydrogen cooling.  
c) A 1000 A shunt consists of 8 strips of nickel-alloy connected in parallel, each having a cross-section of 25x2 mm². The normal voltage drop is 75 mV. The alloy used has the following data: resistivity-\(0.4 \times 10^{-6} \, \Omega \cdot m\), specific heat \(500 \, J/kg \, ^oC\). Specific gravity \(8000 \, kg/m^3\), rate of heat dissipation \(100 \, W/m^2 \, ^oC\). Determine the maximum temperature rise and time taken to reach 99% age of maximum value.  

10

Q.3  
a) Develop the output equation for a single-phase as well as three-phase transformer.  
b) Determine the main dimension of core, the number of turns and cross-section of the conductor for 95 kVA, 11000/400V, 50 Hz single phase core type distribution transformer. The net conducting area in the window is 0.6 times the net cross-section of iron in the core. Assume a square-cross-section for the core, a flux density 0.1 Wb/m², a current density 1.4 A/mm² and space factor 0.2. The height of window is 3 times its width.  

10

Q.4  
a) Write notes on:  
i) mmf for teeth  
ii) Real and apparent flux density  
b) Derive an expression for total mmf in a magnetic circuit.  

5x2

10

PART-B

Q.5  
a) Distinguish between lap winding and wave winding.  
b) Discuss the significance of specific loading in the design of dc machines.  
c) Enumerate the procedure for shunt field design. Derive an expression for shunt field.  

6

14

P. T. O.
Q.6  a) Find main dimensions of a 10 MVA, 11 kV, 50 Hz 150 rpm, 3-phase water wheel generator. The average gap density $= 0.65Wb/m^2$ and ampere conductor/m are 40000. The peripheral speed should not exceed 65 m/s.  
   b) Discuss the various ventilation and cooling methods for alternators.  

Q.7  a) Explain design of rotor bars and slots in an induction motor.  
   b) Explain the dispersion coefficient and how does it effect the performance of an induction motor.  
   c) Discuss hybrid techniques and optimization as used in computer aided design of electrical machines.
End Semester Examination, May 2014
B. Tech. – Fifth Semester
POWER GENERATION OPERATION AND CONTROL (EE-504)

Time: 3 hrs Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Draw prime mover model.
b) What are the functions of AVR?
c) Write an expression for B-matrix loss formula.
d) How gradient search techniques are better than other methods?
e) Define power system stability.
f) How does critical clearing time affect transient stability?
g) Define state estimation.
h) What are the different types of interchange?
i) How energy banking is beneficial?
j) What do you understand by unit commitment? 2x10

PART-A

Q.2 a) Explain the modeling of automatic generation control in details using a diagram. 10
b) Explain the load frequency control of single area system in detail with the help of a diagram. 10

Q.3 a) Discuss factors influencing generation and operating costs of a thermal unit. Discuss formulation of economic dispatch neglecting losses in network. 10
b) The fuel-cost functions (in Rs/hr) for two units are expressed as
   \[ F_1(P_{x1}) = 0.05P_{x1}^2 + 22P_{x1} + 120 \]
   \[ F_2(P_{x2}) = 0.06P_{x2}^2 + 16P_{x2} + 120 \]
   Determine economic operating schedule of plants for load demand of 80 MW neglecting the transmission losses. 10

Q.4 a) Define transient stability? What are the factors affecting transient stability? 5
b) What do you understand by equal area criteria? Explain it in detail. What is the effect of clearing time on stability for a single machine infinite bus? 15

PART-B

Q.5 a) What do you understand by interchange of power and energy? Discuss interchange between two interconnected utilities in an integrated power system. 10
b) Write short notes on: Emergency power interchange and power pools. 10

Q.6 Explain hydrothermal coordination with its advantages. Also develop the coordination equations for hydro-thermal scheduling. 20

Q.7 a) Define power system security. What are its various functions? Also classify the power system security levels? 10
b) Explain contingency analysis. Also explain the use of linear sensitivity factors. 10
End Semester Examination, May 2014
B. Tech. – Fifth Semester
INDUSTRIAL MANAGEMENT (HM-501)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain the following:
   a) Nature of management.
   b) Span of control.
   c) Standard time.
   d) Symbols used for recording in method study.
   e) Stages of plant location.
   f) Factors influencing plant layout.
   g) Economic order quantity.
   h) Purchase management
   i) Industrial relations.
   j) Total quality management.

   2x10

PART-A

Q.2 a) What are functions of management?
    b) Explain the organizing function in detail.
    10

Q.3 Define work-study. Discuss the various methods of time measurement.
    20

Q.4 a) What are objectives of a good plant layout?
    b) Discuss various types of plant layouts with their merits and demerits.
    10

PART-B

Q.5 a) Define material management and discuss its importance.
    b) Discuss ABC control in inventory management and the role of V.E.D. analysis in improving it further.
    10

Q.6 a) Who are the main participants in industrial relations? Discuss the role of the government in shaping the industrial relations.
    b) Discuss some of the Workers Welfare Schemes prevalent in India.
    10

Q.7 Define quality of a product. Discuss various methods of quality control.
    20
End Semester Examination, May 2014
B. Tech. – Fifth Semester
CAREER SKILLS-III (HM-503)

Time: 1 hrs  Max Marks: 50
No. of pages: 4

Note: The paper consists of FIFTY multiple choice questions; Each question has FOUR options with ONE correct answer. Select the correct answer. Attempt all questions. All questions are of ONE mark each. There is no negative marking.

Q.1 If the population of a town is decreased by 10 % and then increased by 10 %, the net effect on the population of the town is:
   a) A decrease of 99 %.
   b) No change.
   c) A decrease of 1 %.
   d) An increase of 1 %.

Q.2 How many times the two hands of a clock meet in a day?
   a) 22.
   b) 11.
   c) 44.
   d) 55.

Q.3 What percentages of numbers from 1 to 70 have 1 or 9 in the unit's digit?
   a) 1.
   b) 14.
   c) 20.
   d) 21.

Q.4 A fruit seller had some apples. He sells 40 % apples and still has 420 apples. Originally, he had:
   a) 588.
   b) 672.
   c) 600.
   d) 700.

Q.5 The reflex angle between the hands of a clock at 10.25 is:
   a) 180°.
   b) 192.5°.
   c) 195°.
   d) 197.5°.

Q.6 Two numbers are respectively 20 % and 50 % more than a third number. The ratio of the two numbers is?
   a) 4:5.
   b) 2:5.
   c) 3:2.
   d) 2:7.

Q.7 A, B and C can do a piece of work in 20, 30 and 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day?
   a) 12 days.
   b) 15 days.
   c) 16 days.
   d) 18 days.

Q.8 A works twice as fast as B. If B can complete a work in 12 days independently, the number of days in which A and B can together finish the work in:
   a) 4 days.
   b) 6 days.
   c) 8 days.
   d) 18 days.

Q.9 The largest 4 digit number exactly divisible by 88 is:
   a) 9944.
   b) 9988.
   c) 8888.
   d) None of these.

Q.10 What is the unit digit in ((6374)^{1763} x (625)^{317} x (341)^{491})?
   a) 0.
   b) 2.
   c) 3.
   d) 5.

Q.11 How many three digit numbers are divisible by 6 in all?
   a) 149.
   b) 150.
   c) 151.
   d) 166.

   a) 5430.
   b) 5420.
   c) 5526.
   d) None of these.

1/4
Q.13 From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done?
a) 676.  b) 567.  c) 756.  d) 112.  

Q.14 In how many ways can the letters of the word ‘LEADER’ be arranged?
a) 72.  b) 36.  c) 360.  d) None of these.  

Q.15 A box contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the box, if at least one black ball is to be included in the draw?
a) 100.  b) 25.  c) 36.  d) 64.  

Q.16 A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?
a) 10/21.  b) 11/21.  c) 13/21.  d) None of these.  

Q.17 Two discounts of 60 % and 20 % equal to a single discount of: 
a) 70.  b) 65.  c) 66.  d) 68.  

Q.18 In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?
a) 1/3.  b) 1/2.  c) 1/4.  d) 3/13.  

Q.19 Six bells commence tolling together and toll at intervals of 2, 4, 6, 8, 10 and 12 seconds respectively. In 30 minutes, how many times do they toll together?
a) 4.  b) 7.  c) 15.  d) 16.  

Q.20 A train can travel 50 % faster than a car. Both start from point A at the same time and reach point B 75 kms away from A at the same time. On the way, however, the train lost about 12.5 minutes while stopping at the stations. The speed of the car is:
a) 110 km/h.  b) 120 km/h.  c) 130 km/h.  d) 140 km/h.  

Q.21 The ratio between the speeds of two trains is 7:8. If the second train runs 400 km in 4 hours, then the speed of the first train is:
a) 67.5 km/h.  b) 57.5 km/h.  c) 77.5 km/h.  d) 87.5 km/h.  

Q.22 A car travelling with \( \frac{5}{7} \) of its actual speed covers 42 km in 1 hr 40 min 48 sec. Find the actual speed of the car is:
a) 17\( \frac{1}{2} \).  b) 20.  c) 30.  d) 35.  

Q.23 A farmer travelled a distance of 61 km in 9 hours. He travelled partly on foot @ 4 km/hr and partly on bicycle @ 9 km/hr. The distance travelled on foot is:
a) 13km.  b) 15km.  c) 16km.  d) 17km.  

Q.24 Which of the following diagrams indicates the best relation between Pigeon, Bird and Dog?
a) \( \text{Diagram a) } \)  b) \( \text{Diagram b) } \)  c) \( \text{Diagram c) } \)  d) \( \text{Diagram d) } \)  

Q.25 In what ratio must a grocer mix two varieties of pulses costing Rs. 15 and Rs. 20 per kg respectively so as to get a mixture worth Rs. 16.50 kg?  

2/4
Q.26 The cost of Type 1 rice is Rs. 15 per kg and Type 2 rice is Rs. 20 per kg. If both Type 1 and Type 2 are mixed in the ratio of 2:3, then the price per kg of the mixed variety of rice is:
   a) Rs. 18.  
   b) Rs. 18.50. 
   c) Rs. 19.  
   d) Rs. 19.50. 

Q.27 A merchant has 1000 kg of sugar, part of which he sells at 8% profit and the rest at 18% profit. He gains 14% on the whole. The quantity sold at 18% profit is:
   a) 400 kg. 
   b) 450 kg. 
   c) 550 kg. 
   d) 600 kg. 

Q.28 3 pumps, working 8 hours a day, can empty a tank in 2 days. How many hours a day must 4 pumps work to empty the tank in 1 day?
   a) 11. 
   b) 12. 
   c) 9. 
   d) 10. 

Q.29 A fort had provision of food for 150 men for 45 days. After 10 days, 25 men left the fort. The number of days for which the remaining food will last, is:
   a) 40. 
   b) 41. 
   c) 42. 
   d) 43. 

Q.30 Look at this series: 36, 34, 30, 28, 24... What number should come next?
   a) 20. 
   b) 22. 
   c) 23. 
   d) 26. 

Q.31 Look at this series: 664, 332, 340, 170, _____, 89, ... What number should fill the blank?
   a) 85. 
   b) 97. 
   c) 109. 
   d) 178. 

Q.32 In a class of 120 students numbered 1 to 120, all even numbered students opt for Physics, whose numbers are divisible by 5 opt for Chemistry and those whose numbers are divisible by 7 opt for Math. How many opt for none of the three subjects?
   a) 19. 
   b) 41. 
   c) 21. 
   d) 57. 

Q.33 A and B invest in a business in the ratio 3:2. If 5% of the total profit goes to charity and A’s share is Rs. 855, the total profit is:
   a) Rs. 1400. 
   b) Rs. 1500. 
   c) Rs. 1425. 
   d) Rs. 1540. 

Q.34 Three partners shared the profit in a business in the ratio 5:7:8. They had partnered for 14 months, 8 months and 7 months respectively. What was the ratio of their investments?
   a) 5:7:8. 
   b) 20:49:64. 
   c) 38:28:41. 
   d) None of these. 

Q.35 A shopkeeper sells some articles at the profit of 25% on the original price. What is the exact amount of profit? To find the answer, which of the following information given in Statements I and II is/are necessary?
   I- Sale price of the article. 
   II- Number of articles sold.
   a) Only I is necessary. 
   b) Only II is necessary. 
   c) Either I or II is necessary. 
   d) Both I and II are necessary. 
   e) None of these. 

Q.36 The lateral surface area of cube is 100 square units. Find the volume of cube
   a) 122 m³. 
   b) 135 m³. 
   c) 125 m³. 
   d) 120 m³.
Q.37 Find the number of squares in a chessboard.
   a) 204.          b) 224.          c) 64.          d) 32.  

Q.38 Find the sum of exterior angles in a pentagon?
   a) 360 deg.    b) 450 deg.    c) 540 deg.    d) 720 deg.  

Q.39 There are two examinations rooms A and B. If 10 students are sent from A to B, then
the number of students in each room is the same. If 20 candidates are sent from B to
A, then the number of students in A is double the number of students in B. The
number of students in room A is:
   a) 20.          b) 80.          c) 100.          d) 200.  

Q.40 If a - b = 3 and \( a^2 + b^2 = 29 \), find the value of \( ab \):
   a) 10.          b) 12.          c) 15.          d) 18.  

Q.41 Urgent and Important activities will find place in your schedule as:
   a) Could.  b) Should.  c) Must.  d) None of these.  

Q.42 When you try to take more work load than you can handle it is called:
   a) Overreaching.  b) Delegation.  c) Procrastination.  d) Remuneration.  

Q.43 Which of the following techniques find place in problem solving process?
   a) 5 Why Technique.  b) Fish Bone Diagram.  c) Root Cause Analysis.  d) All of the above.  

Q.44 What is the first step in problem solving process?
   a) Generation of Alternatives.  b) Selecting Alternatives.  c) Problem Definition.  d) Implementing Solutions.  

Q.45 What will help you in managing an irate customer?
   a) Empathy.  b) Micro blogging.  c) Listening.  d) Both a) and c).  

Q.46 Which of the following is a customer engagement program:
   a) Customer Satisfaction Survey.  b) Mystery Audit.  c) Focus group discussion.  d) All of the above.  

Q.47 A good salesman will not:
   a) Provide piecemeal solution.  b) Think about customer’s bottom line.  c) Think Long term.  d) Strike win win.  

Q.48 If I am selling a higher version of the existing product, I am:
   a) Mis selling.  b) Cross selling.  c) Up selling.  d) Over selling.  

Q.49 If I encourage participation from everybody in a GD then I am a:
   a) Initiator.  b) Moderator.  c) Channelizer.  d) Concluder.  

Q.50 It is advisable to reach the interview venue early by:
   a) 10 minutes.  b) 60 minutes.  c) 30 minutes.  d) 1 minute.  

4/4
End Semester Examination, May 2014  
B. Tech. – Fifth Semester  
INTERNET AND WEB TECHNOLOGY (IT-501)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is a router? On which layer does it work?  
b) Differentiate between relative and absolute URL.  
c) Why TCP is called end-to-end protocol?  
d) Discuss the role of Internet Service Provider.  
e) What are plug-ins? How are they different from helper applications?  
f) Write features of JSP.  
g) How do we link images in HTML?  
h) What are cookies? Mention any two functions.  
i) Compare features of XHTML and HTML.  
j) How is Intranet different from Internet?  

2x10

PART-A

Q.2  
a) What are internetworking devices? Explain working of any four of them along with functions, advantages, disadvantages and layers at which they operate.  
b) Explain in details about OSI reference model. Briefly discuss the advantages of layered approach.

10

Q.3  
a) What are different strategies for searching the web? Discuss with an example.  
b) How does a meta-search engine work?  
c) Explain the function of different components of a search engine.

5  
5  
10

Q.4  
a) Explain the following HTML tags with all attributes:  
  i) <BODY>  
  ii) <IMG>  
  iii) <TABLE>  
  iv) <A>  
b) What is the need of meta tag in an HTML document?  
c) Explain XML schema with an example.  
d) Write HTML code to link one document with other.

10  
3  
3  
4

PART-B

Q.5  
a) Discuss in detail the document object model (DOM) in JavaScript.  
b) Design a webpage using JavaScript that uses the on-mouse-over and on-mouse-out revert handlers to load a new image when a user mouses over an image and to restore the image when user moves the mouse off the image.

8  
12

Q.6  
a) Differentiate between client-side and server-side programming.  
b) Discuss advantages of Java servlets over CGI interface.  
c) Explain basic web architecture with reference to web server and web client? Discuss features of any one web server.

4  
4  
12

Q.7  
a) Why do we need to encrypt the data? Mention different encryption techniques and also discuss their advantages and disadvantages in detail.  
b) What are different types of firewalls? Discuss problems associated with them.

10  
10
Q.1  
a) List out factors affecting wages.  
b) Discuss wage incentive plans.  
c) Discuss functions of production planning and control.  
d) Define inventory, types of inventory? Why they are maintained?  
e) Explain the objectives of a flow process chart.  
f) What is the difference between continuous production and job production?  

**PART-A**

Q.2  
a) Explain the primary and secondary objectives of personnel management.  
b) Explain the role of communication and coordination and explain with a neat sketch machinery of effective communication.

Q.3  
a) Explain the various types of production systems and explain the production on system suitable for job work.  
b) A company requires 20000 units of raw materials costing Rs. 3 per unit. The cost of placing an order is Rs. 40 and carrying costs are 10 % per year per unit of the average inventory. Determine the following and derive the formula used:  
i) Economic order quantity.  
ii) Cycle time.  
iii) Total variable cost of managing the inventory.

Q.4  
a) Explain the objectives of work measurement.  
b) Explain the procedure of method study.  
c) Describe the process chart symbols.

**PART-B**

Q.5  
a) Explain the difference between value analysis and value engineering.  
b) Explain the techniques of value analysis/ engineering.  
c) Explain unnecessary cost and important reasons which are responsible for unnecessary costs in a product.

Q.6  
a) Explain the factors influencing the choice of a manufacturing process.  
b) Explain the batch production system and state its characteristics.

Q.7  
a) Describe the different factors which are responsible to replace an equipment, although it may be running.  
b) The maintenance cost and resale value per year of a machine whose purchase price is Rs. 7000 is given below:

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>900</td>
<td>1200</td>
<td>1600</td>
<td>2100</td>
<td>2800</td>
<td>3700</td>
<td>4700</td>
<td>5900</td>
</tr>
<tr>
<td>Value</td>
<td>4000</td>
<td>2000</td>
<td>1200</td>
<td>600</td>
<td>500</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
</tbody>
</table>

When should the machine be replaced?
Q.1 a) Prove that if three eccentric masses are completely balanced by themselves, they must be coplanar.  
   b) Explain the terms: sensitivity, stability, isochronisms and hunting in connection with governors.  
   c) Explain the terms: primary disturbing force and secondary disturbing force in connection with reciprocating parts. Why do we normally go in for partial balancing in case of reciprocating parts?  
   d) State D’Alembert’s principle.  
   e) Explain different methods of finding the natural frequency of free longitudinal vibrations.  
   f) How gyroscopic couple affects the motion of an aeroplane while taking a turn?  
   g) What do you understand by "Torsionally equivalent shaft"?

PART-A

Q.2 a) The diameter of cylinder of a vertical single cylinder double acting diesel engine is 300 mm. The lengths of crank and connecting rods are 250 mm and 1.125 m respectively. Reciprocating parts are having a mass of 140 kg and engine is running at 270 rpm. The compression ratio is 14 and pressure remains constant during injection of oil for 1/10 of the stroke. The index of law for compression and expansion is 1.35 (i.e. pv^{1.35} = constant). Find the torque on the crank shaft when the crank makes an angle of 45° with IDC during expansion stroke. Suction may be assumed at a pressure of 1000 N/m^2.

Q.3 a) Explain the term spin and precession. How do they differ from each other?  
   b) An aeroplane makes a complete half circle of 50 m radius, towards left, when flying at 200 km/hr. They rotary engine and the propeller of the plane has a mass of 400 kg with a radius of gyration of 300 mm. The engine runs at 2400 rpm clockwise when viewed from the rear. Find the gyroscopic couple on the aircraft and state its effect on it. What will be the effect, if the aeroplane turns to its right instead of to the left?

Q.4 a) What are conditions for a body to be in equilibrium under the action of two forces, three forces, and two forces and a torque?  
   b) Find the torque required to be applied to link AB of the linkage shown in the figure below to maintain the static equilibrium.

P. T. O.
PART-B

Q.5  a) What are the criteria that are taken into account to judge the quality of governing?  
4
b) A Proell governor has arms of 300 mm length. The upper arms are hinged on the  
axis of rotation, whereas the lower arms are pivoted at a distance of 35 mm from  
the axis of rotation. The extensions of lower arms to which the ball are attached  
are 100 mm long. The mass of each ball 8 kg and the mass on the sleeve is 60 kg,  
at the minimum radius of rotation of 200 mm; the extensions are parallel to the  
governor axis. Determine the equilibrium speed of the governor for the given  
configuration. What will be the equilibrium speed for the maximum radius of 250  
mm?  
16

Q.6  a) Define transmissibility. How do you isolate the vibration to achieve better  
transmissibility?  
4
b) A shaft is simply supported at the ends and is of 20 mm in diameter and 600 mm  
in length. The shaft carries a load of 19.62 N at its centre. The weight of shaft per  
eter length is 248.2 N. Find the critical speed of the shaft.  
Take Young's modulus = 200 GN/m².  
16

Q.7  The moment of inertia of three rotors A, B and C are respectively 400 kg/m²,  
160 kg/m² and 10 kg/m². The distance between rotor A and B is 2 m and they are  
connected by a shaft of diameter 50 mm. The distance between rotor B and C is also  
2 m and they are connected by a shaft of diameter 25 mm. Determine:  
a) Natural frequencies of torsional vibrations.  
b) Position of nodes.  
Take modulus of rigidity as 80 kN/mm² and neglect inertia of shaft.  
20
End Semester Examination, May 2014
B. Tech. ~ Fifth Semester
MACHINE DESIGN (M-503)

Time: 3 hrs                         Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Briefly describe the different types of fluctuating variable stresses.
b) A shaft is transmitting power. Explain how the rotating elements produce fluctuating stresses in the shaft?
c) What is compression spring? Define solid length, free length in case of compression spring.
d) What is difference between thick film lubrication and thin film lubrication?
e) What is Lewis form factor? How does it vary with number of teeth on gear? 4x5

PART-A

Q.2 A solid circular shaft, 15 mm in diameter is subjected to torsional shear stress that varies from 0 to 35 N/mm² and at the same time is subjected to an axial stress that varies from -15 N/mm² to 30 N/mm². The frequencies of vibration of these stresses are equal to the shaft speed. The shaft is made of steel FeE 400 ($S_u=540$ N/mm² and $S_p=400$ N/mm²) and the corrected endurance limit of shaft is 200 N/mm². Determine factor of safety.

Q.3 A shaft is to transmit 2 kW at 750 rpm. Shaft is supported in bearings at 300 mm apart. Two pulleys of 300 mm diameter and 150 mm diameter are located at B and D as shown in the figure. Consider that belt tensions are vertical for both pulleys. The ratio of belt tensions in pulleys is 3. Determine the diameter of shaft if $k_s=1.5$, $k_b=1.0$, $\sigma=110$ MPa and $\tau=65$ MPa.

Q.4 A helical compression spring is subjected to $P_{min}=40$ N and $P_{max}=120$ N load cycle. The diameter of wire is 3 mm with a spring index of $c=7$. The spring is made of oil hardened and tempered steel. Determine the factor of safety if, $\sigma_u=1500$ N/mm².

20

P. T. O.
PART-B

Q.5 Design a full hydrodynamic journal bearing with following specifications for machine tool applications:
- Bearing diameter = 60 mm
- Radial load = 8 kN
- Speed = 1500 rpm
- Inlet temperature = 35 °C
- Bearing metal = Babbit
- Minimum oil film thickness = 20 microns

Find the length of bearing and select suitable oil for this application. 20

Q.6 Design a pair of spur gears with 20° full-depth involutes teeth. The pinion shaft is connected to a 12 kW, 1400 rpm motor. The starting torque of motor is 150% of rated torque. The speed reduction is 4:1. Pinion as well as gear are made of plain carbon steel 40 Cr (σtr = 600 N/mm²). The factor of safety is 1.5. 20

Q.7 Write short notes on any three.
   a) Design considerations for casting.
   b) Ergonomic consideration in design.
   c) Gear lubrication.
   d) Surging phenomenon in spring. 20
End Semester Examination, May 2014
B. Tech. – Fifth Semester
PRODUCTION ENGINEERING (M-504 / M-504A)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Differentiate between process planning and process sheet.
b) Explain 'Tolerance Stacking'.
c) State difference between jigs and fixtures.
d) State 3-2-1 principle for jigs and fixtures.
e) Enlist all the manufacturing processes used for manufacturing of gears.
f) What do you understand by 'Lead' of thread? How is it related to pitch of thread?
g) What does M18 x 1.5 stands for thread designation?
h) What is meant by loading of a grinding wheel?
i) State the importance of 'truing' and 'Dressing' in a grinding wheel.
j) Differentiate between roughness and waviness.

2x10

PART-A

Q.2  
A batch size of 400 pieces of mild steel spindle is to be machined. Generate a process sheet for the components shown in the below figure. All dimensions are in mm.

Q.3  
Propose the design of a jig or fixture required to machine a through hole on the round pin as shown in the given figure.

Q.4  
a) Explain gear shaping and gear hobbing process with help of neat sketches.
b) With the help of a neat sketch, explain how the pitch of spur gear is measured and checked.

20

20

20

10

10

P. T. O.
PART-B

Q.5  a) Explain with a neat sketch, thread rolling process for manufacturing of threads. 
     Enlist the advantages of thread rolling process.  
     b) How will you check major diameter and pitch diameter of a screw?  
        10  
        10  

Q.6  What is the conventional system followed for designating grinding wheels. Explain in 
     detail each term of designating system along with its significance.  
        20  

Q.7  a) Explain the importance of surface finish. Discuss the various methods for 
     measurement of surface roughness.  
     b) Explain in detail the process of lapping and honing in detail. Also discuss the 
     application of these processes.  
        10  
        10
End Semester Examination, May 2014
B. Tech. – Fifth Semester
METROLOGY, MEASUREMENT AND CONTROL (M-505)

Time: 3 hrs                          Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Write the formula on which sine bar is based.
     b) What is vacuum pressure?
     c) Name the entity measured by 2-wire method.
     d) Name an instrument for RPM measurement.
     e) Write the governing formula behind variable resistance transducers.
     f) What do you mean by static characteristic of an instrument? Give two examples also.
     g) In signal flow graphs, what is an input node?
     h) While analyzing any test data, name the various methods of determining statistical averages.
     i) Explain closed-loop system with any practical example.
     j) What is grounding? 2x10

PART-A

Q.2 a) What are comparators? Explain pneumatic type comparator along with its advantages and limitations. 10
     b) Explain the method for measuring the surface roughness of a ferrous plate. 10

Q.3 a) What are pyrometers? Explain optical pyrometer. 7
     b) Enumerate various methods for flow measurement and explain hot-wire anemometer method. 7
     c) Describe the method for measuring force. 6

Q.4 a) How variable inductance transducers work? Explain the operation with well known principles. 8
     b) Explain the working of piezo-electric transducers. 7
     c) Write about the construction and operation of a photo-emissive cell. 5

PART-B

Q.5 a) Derive an expression for first-order system response when ramped input is provided. 15
     b) Briefly explain various kinds of errors which may originate in an instrument and distract readings. 5

Q.6 a) Derive the transfer function for a spring-mass-clamp system. 8
     b) The characteristic equation of a closed loop control system is $3s^4 + 10s^3 + 5s^2 + 5s + 4 = 0$. Construct Routh array to determine the stability. 5
     c) For the control system drawn below, find the values of the flow signals at various points for an output value of $C = 100$.

     [Diagram]

Q.7 a) Describe the working of DAC converter in detail. 10
     b) Explain magnetic tape recorder technique for recording the accumulated data. 10
End Semester Examination, May 2014
B. Tech. – Fifth / Sixth Semester
COMPUTER AIDED DESIGN (M-602)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define the term CAE.
b) What is perspective projection?
c) Define the blending function.
d) What is convex hull property?
e) What is meant by synthetic curve?
f) What is a tabulated cylinder?
g) What is part programming?
h) Define repetitive programming.
i) Explain any two M-words.
j) Define flexible automation.

\[ \text{PART-A} \]

Q.2
a) What is computer aided design? Discuss reasons for implementing CAD in industry.

\[ 5 \]

b) What do you understand by concatenated transformations? Explain with examples.

\[ 5 \]

c) A triangle \( PQR \) with vertices \( P(0,0), Q(50,20) \) and \( R(50,80) \) is to be enlarged twice along \( X \)-direction, compressed to half along \( Y \)-direction and rotated by an angle of 30 degree in clockwise direction. Determine the coordinates of the vertices of the new triangle.

\[ 10 \]

Q.3
a) State and explain the continuity condition in synthetic curves.

\[ 5 \]

b) Explain the parametric equations for the following analytic curves:
   i) Circle
   ii) Ellipse

\[ 5 \]

c) Four vertices of Bezier polygon are \( P_0 (1,1), P_1 (2,3), P_2 (4,3), \) and \( P_3 (3,1) \). Determine seven points on the Bezier curve.

\[ 10 \]

Q.4
a) Explain in detail the CSG approach for the creation of solid models.

\[ 10 \]

b) Distinguish between cell decomposition and spatial occupancy enumeration.

\[ 10 \]

\[ \text{PART-B} \]

Q.5
a) What is direct numerical control? Explain its various components.

\[ 10 \]

b) Explain the function of MCU in NC machine tools. What is the role of PLC in CNC systems?

\[ 10 \]

Q.6
a) Explain the concept of absolute versus increment positioning and fixed zero versus floating zero in respect of CNC machine tools.

\[ 10 \]

b) Write a part program to drill holes in a plate of thickness 15 mm. Use appropriate speed and feed rate.

\[ \begin{array}{c}
\includegraphics[width=0.2\textwidth]{diagram.png}
\end{array} \]

\[ 10 \]

Q.7
a) What are the various approaches available for computer aided process planning. Which is better? Explain your answer.

\[ 10 \]

b) Write short notes on any two:
   i) MRPI
   ii) MPS
   iii) Part classification and coding

\[ 5 \times 2 \]
End Semester Examination, May 2014
B. Tech. – Fifth / Sixth / Seventh Semester
SOFTWARE ENGINEERING (IT-702)

Time: 3 hrs                          Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions
from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Is software a product or process? Justify.
     b) Explain data dictionary.
     c) Explain coupling.
     d) What are principles of software testing?
     e) Explain software prototyping.
     f) What is the need of design document?
     g) Differentiate between alpha and beta tests.
     h) Explain the need of software project management.
     i) What is the benefit of modular design?
     j) What is software review?

     2x10

PART-A

Q.2  a) Explain in detail iterative enhancement model with a neat diagram.
     b) What is the purpose of developing rapid application development model?

     10

Q.3  a) Draw level 0 and level 1 DFD for library management system.
     b) What are the benefits of software requirement specifications?

     10

Q.4  a) Explain project size estimation techniques.
     b) Consider a project with the following functional units: 50 user inputs, 40 user
        outputs, 35 user enquiries, 06 user files, 04 external interfaces.
        Assume all complexity adjustment factors and weighting factors are average.
        Compute function point for the project.
        [Weighting factors: EI=4, EO=5, EQ=4, ILF=10, EIF=7]

     10

PART-B

Q.5  a) Explain objectives of designing formal technical reviews and reports.
     b) Explain quality control and quality assurance.

     10

Q.6  a) Explain the characteristics and need of a good software design.
     b) Explain the difference between information hiding and abstraction in context with
        system design.

     10

Q.7  Write short notes on:
     a) Stress testing.
     b) Behavioral modeling.
     c) Cohesion.
     d) Software reliability.

     5x4
End Semester Examination, May 2014
B. Tech. – Fifth Semester

NUMERICAL METHODS AND OPTIMISATION TECHNIQUES (MA-501)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) If \( \sqrt{29} = 5.385 \) and \( \sqrt{11} = 3.317 \) correct to four significant figures, then find the maximum error.
    2
b) Write the normal equations for fitting a curve \( xy^n = b \).
    3
c) Show that \( N-R \) formula to find \( \sqrt{2} \) can be expressed in the form:
    \[ x_{n+1} = \frac{1}{2} \left( x_n + \frac{a}{x_n} \right) \]
    3
    \( n = 0,1,2 \)
d) Compare Gauss-Jacobi and Gauss-Seidal Methods for solving linear system of the form \( Ax = B \).
    3
e) State Boole’s Rule of integration.
    3
f) Write down formula to solve 2nd order Differential equations using R-K method of order 4.
    3
g) Define LPP with one example.
    3

PART-A

Q.2  a) Use Newton’s backward interpolation to construct an interpolating polynomial of degree 3 for this data:
    \[ f(-0.75) = -0.07181250, f(-0.5) = -0.024750, f(-0.25) = 0.33493750, f(0) = 1.10100. \]
    Hence find \( f\left(\frac{-1}{3}\right) \).
    10
b) Find a second degree parabola \( y = ax^2 + bx + c \) to the following:
    \[
    \begin{array}{cccccc}
    x: & 1 & 3 & 5 & 7 & 9 \\
    y: & 2 & 7 & 10 & 11 & 9 \\
    \end{array}
    \]
    10

Q.3  a) Use N-R method to find the roots of the equation: \( e^x = 2x + 21 \).
    10
b) Use fixed-point iteration method to find a root of the following equation, correct to 3 decimal places:
    \( x^3 + x^2 -1 = 0 \)
    10

Q.4  a) Using power method find largest eigen value of the matrix:
    \[
    A = \begin{bmatrix}
    25 & 1 & 2 \\
    1 & 3 & 0 \\
    2 & 0 & -4 \\
    \end{bmatrix}
    \]
    10
b) Solve the system of equations:
    \[ 5x - y - 2z = 142 \]
    \[ x - 3y - z = -30 \]
    \[ 2x - y - 3z = -5 \]
    By Gauss-Jordan method.
    10

P. T. O.
**PART-B**

Q.5 a) Find the first order derivative of $f(x)$ at $x = 1.5$ if:

<table>
<thead>
<tr>
<th>$x$</th>
<th>1.5</th>
<th>2.0</th>
<th>2.5</th>
<th>3.0</th>
<th>3.5</th>
<th>4.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>3.375</td>
<td>7.0</td>
<td>13.625</td>
<td>24.0</td>
<td>38.875</td>
<td>59.0</td>
</tr>
</tbody>
</table>

b) Evaluate $\int e^{-x^2} \, dx$ by Simpson’s $\frac{1}{3}$ rule.

Q.6 a) Use Taylor’s method to obtain approximating value of $y$ at $x = 0.2$ for the differential equation $\frac{dy}{dx} = 2y + 3e^x$, $y(0) = 0$.

b) Using Euler’s method solve for $y$ at $x = 0.1$ from $\frac{dy}{dx} = x + y + xy$, $y(0) = 1$ taking step size $h = 0.025$.

Q.7 a) Maximize $z = 3x + 4y$ subject to the constraints

$2x + 2y \leq 80$

$2x + 4y \geq 120$

$x, y \geq 0$

By using Graphical method.

b) Consider the LPP:

Max $z = 3x_1 + 2x_2$

Subject to

$x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

$x_1, x_2 \geq 0$

By simplex method.
End Semester Examination, May 2014
B. Tech. – Sixth Semester
AIRCRAFT SYSTEMS (AE-505)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) A canard surface has an angle of incidence that causes it to stall ______ (before or after) the main wing stalls.
   b) A trim tab ________ (does or does not) move relative to the control surface on which it is installed as the surface is moved in flight.
   c) A fluid power system that uses a compressible fluid is called a _______ system.
   d) Hydraulic system pressure that is higher than normal indication could mean that the ______ valve is failing to ______ the pump and a relief valve is maintaining the pressure.
   e) Explain the method and purpose of fuel dumping.
   f) Long exposure at an altitude of 10,000 ft. and above without supplemental oxygen will result in ______ and fatigue.
   g) When oxygen is needed for a backup in a pressurized aircraft the ________ system is used because of its simplicity, efficiency, and minimum maintenance requirement?
   h) More heat is removed from the pressurizing air after it leaves the secondary heat exchanger as it spins the ________ which drives the C.F. compressor in the air cycle system.
   i) A fire extinguishing agent that is also used to inert fuel tanks is ________.
   j) Deicer boots are actuated symmetrically to minimize control problems caused by disturbance of the________. 2x10

PART-A

Q.2 a) Explain the secondary controls.
   b) Explain the operation of power-operated and power-assisted controls. 10

Q.3 a) Explain the checks to be carried out on the hydraulic oil.
   b) Explain the different types of hydraulic pumps used on aircraft. 10

Q.4 a) Explain the two-engine cross feed fuel system.
   b) Indicate the type of fuel tanks in use. Explain the details of an integral fuel tank. Also explain what do you understand by fuel dumping. 10

PART-B

Q.5 a) Describe the vapour cycle air cooling system used on aircraft.
   b) Describe the water separators used in air cycle cooling system. 12

Q.6 a) Explain the gaseous, liquid and chemical oxygen systems used on aircrafts.
   b) Describe the gaseous oxygen system filling procedure and precautions. 12

Q.7 a) Describe CO detectors, photoelectric and ionization type smoke detectors.
   b) Describe the pitot-static system ice protection.
   c) Describe the windshield ice protection system. 15
End Semester Examination, May 2014  
B. Tech. – Sixth Semester  
FLIGHT MECHANICS-II (AE-603)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write notes on any five:  
a) Effect of elevator power over longitudinal stability.  
b) Spoiler control.  
c) Importance of trim condition for stick free longitudinal stability.  
d) Rudder lock.  
e) Diagonal effect.  
f) Phugoid and short period mode.  

PART-A

Q.2 a) Drive fundamental equation of static longitudinal stability with the help of a suitable 
diagram? Drive and explain the wing contribution in it.  
b) Drive the neutral point for the stick fixed static longitudinal stability with wing 
contribution.  
c) Draw and explain the typical pitching moment curve $C_M$ with $C_L$ for longitudinal 
stability.  

Q.3 a) Drive an expression for the control surface hinge moment with elevator and tab 
control. Explain it in detail with the help of graphs and diagrams.  
b) Evolve an expression for float angle for the mentioned control surfaces and explain 
its importance.  
c) Write a short note on floating and restoring tendencies.  
d) What are the different types of aerodynamic balancing methods?  

Q.4 a) Drive an expression for stick free longitudinal stability. Explain it with the help of a 
diagram.  
b) Drive the neutral point for the stick free static longitudinal stability.  
c) Drive an expression for elevator angle per g form the basic balancing equation for 
the accelerated flight making.  
i) Pull up maneuvering flight.  
ii) Horizontal turn maneuvering flight.  

PART-B

Q.5 a) Drive an expression for the static directional stability for rudder fixed aircraft with 
wing, propeller, vertical and horizontal tail. Explain the stability contribution by 
each part with the help of a diagram and a graph.  
b) Draw and explain the typical yawing moment curve $C_N$ with $\psi$ for directional 
stability.  
c) Write a short note on Dorsal Fin.  

Q.6 a) What is the effect of wing sweep, flaps and power on the dihedral effect?  
b) Drive and estimate the aileron or lateral control power. Mention all the assumptions 
taken in account and explain with the help of a suitable diagram.  
c) Draw and explain the typical yawing moment curve $C_N$ with $\psi$ for dihedral stability.  

Q.7 Drive the equation of longitudinal motion. Evolve it to the non-dimensional hinge 
moment and simultaneous equation.
End Semester Examination, May 2014  
B. Tech. – Sixth Semester  
AIRCRAFT DESIGN (AE-604)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define mission profile. How does mission profile help in determining Wt?  
b) What are various types of high lift devices that can be used in an aircraft? Explain configuration of each type.

c) What factors affect take-off weight? Derive its equation.

d) Define T/W. Give its formulation for jet and propeller-based aircraft.

e) Describe cabin layout for an aircraft with a diagram.

f) Draw the diagram of a tail dragger configuration with necessary terms.

g) Describe 4 tail designs with diagrams.

h) Describe the various terms in airfoil geometry with a diagram.

i) Show configurations of various inlet locations for buried engines.

j) Determine the stroke length of an oleo shock absorber:  
   Efficiency of tire = 0.47; Efficiency of oleo = 0.7; Ngear = 2.8;  
   Vertical velocity = 10 ft/s; diagram of tire = 20 inches;  
   Rolling dia. of tire = 17 inches.  

2x10

PART-A

Q.2  
a) Explain the nomenclature for each family of airfoils using examples.  
b) Describe in brief factors influencing wing design.

c) Write short notes on:  
   i) Take-off distance  
   ii) Catapult take-off  
   iii) Landing distance  
   iv) Arrested landing.

d) Draw and explain V-n diagram in detail.

e) Explain in brief concept of configuration and weight with importance of each.  

4x5

Q.3  
a) Calculate the weight fractions for a jet powered combat aircraft with following input parameters:

<table>
<thead>
<tr>
<th>Input Parameter</th>
<th>Value (Unit in F.P.S unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cruise Mach Number</td>
<td>2.1</td>
</tr>
<tr>
<td>Max. Mach Number</td>
<td>1.9</td>
</tr>
<tr>
<td>Cruise Altitude</td>
<td>60,000 ft</td>
</tr>
<tr>
<td>Operating Radius</td>
<td>300 nautical miles</td>
</tr>
<tr>
<td>Engine TSFC (min)</td>
<td>0.8</td>
</tr>
<tr>
<td>Engine TSFC (max)</td>
<td>1.8</td>
</tr>
<tr>
<td>Thrust</td>
<td>22,000 lbs</td>
</tr>
<tr>
<td>Aspect ratio</td>
<td>2.4</td>
</tr>
<tr>
<td>Combat time</td>
<td>8 min</td>
</tr>
<tr>
<td>Combat altitude</td>
<td>20,000 ft</td>
</tr>
<tr>
<td>Loiter time</td>
<td>20 min</td>
</tr>
<tr>
<td>Loiter altitude</td>
<td>10,000 ft</td>
</tr>
<tr>
<td>Structural Factor</td>
<td>0.5</td>
</tr>
<tr>
<td>Payload (non-expendable)</td>
<td>600 lbs</td>
</tr>
<tr>
<td>Payload (expendable)</td>
<td>500 lbs</td>
</tr>
</tbody>
</table>

10

b) Write about how estimation of wing drag has to be done for subsonic and supersonic aircraft with equations and describe drag bucket for the same.  

10

P. T. O.
Q.4  
a) Briefly describe the different aft tail arrangements with figures and examples.

b) Which are the different high lift creating devices used in aircrafts and describe them in short with diagram? Show the variation in lift generated in the presence and absence of high lift generating devices.

PART-B

Q.5  
a) Which are the factors that influence the volume considerations in fuselage design? Describe each in detail. Explain how cockpit designing is done?

b) Describe how fineness ratio affects fuselage shape? Briefly describe about the various fuselage shapes. Derive an equation to calculate the drag over fuselage for subsonic commercial aircraft.

Q.6  
a) Describe the oleo shock absorber arrangement. Explain why oleo performance is better than remaining other shock absorber arrangements. Show how landing gear stroke length is independent of aircraft weight.

b) Design a fuselage for the a 4-seater aircraft with following inputs:
   i) Cruise Mach Number = 0.2
   ii) Cruise Altitude = 3000 ft
   iii) D/L = 0.3
   iv) Diameter = 9 ft
   v) \( \rho = 0.069984 \text{ lb/ft}^3 \)
   vi) \( F=1.06 \)
   vii) \( Q=1 \)
   viii) \( \rho = 1.18 \times 10^{-5} \text{ lb/(ft-s)} \).

   Use power series for fuselage design.

Q.7  
a) Explain vertical, horizontal and canard tail sizing, respectively. Discuss how spin recovery is done using tail surfaces?

b) Discuss the various types of landing gear arrangements with diagrams. Compare bicycle and tail dragger arrangements in details.

c) Design a wing for a small business jet with following inputs:
   i) Cruise Mach Number = 0.80
   ii) Cruise Altitude = 40,000 ft
   iii) Wing Area = 200 ft²
   iv) Weight at start of Cruise = 15,300 lbs
   v) Weight at end of Cruise = 11,500 lbs

   Specify the following to solve the same:
   i) Wing Section type.
   ii) Aspect Ratio.
   iii) Taper Ratio.
   iv) Sweep Angle.
End Semester Examination, May 2014
B. Tech. – Sixth Semester
PLANT BIOTECHNOLOGY (BT-601)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer:
   a) Differentiate between cytotenic and organogenic differentiation.
   b) What is cellular totipotency?
   c) Mention the importance of Meristem culture.
   d) How does colchicine induce polyploidy?
   e) Give a disadvantage of somacoidal variation.
   f) What is antibiotism?
   g) What do you understand by gene silencing?
   h) Mention a therapeutic role of flavonoids. 2½x8

PART-A

Q.2 a) Describe the process of micropropagation. What are the factors affecting regeneration of plants in-vitro? 12
   b) What are androgenic haploids? How are they produced and for what purpose? 8

Q.3 a) Describe various methods of protoplast isolation. 10
   b) Discuss the chromosomal status of somatic hybrids. 10

Q.4 Write short notes on:
   a) Role of nitrogenase enzyme complex. 10x2
   b) Benefits of bioferitizers.

PART-B

Q.5 a) Explain the Maxam-Gilbert sequencing method. 10
   b) Describe the mechanism of post trans-criptional modification of a protein in general. 10

Q.6 a) What are binary vectors? How are they advantageous in genetic transformation? 10
   b) Describe direct gene transfer methods in plants. 10

Q.7 a) How do plant storage proteins improve shelf-life of plant products? Give examples. 10
   b) Critically evaluate the production and use of genetically modified crops. 10
End Semester Examination, May 2014
B. Tech. – Sixth Semester
ENVIRONMENTAL BIOTECHNOLOGY (BT-602)

Time: 3 hrs Max Marks: 100
No. of pages: 1
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Enumerate the various pollutants present in air and water.
b) Enlist the current strategies to reduce soil pollution.
c) What are the causes of ozone depletion?
d) How do we use aquatic plants for waste water treatment?
e) Why it is hard to degrade xenobiotic compound?
f) Define:  i) Biomining.    ii) Bioleaching.
g) What do you mean by biomethanation?
h) Enumerate the advantages of water harvesting.
i) What do you mean by pyrolysis?
j) How a fungus is used in biodegradation process? 2x10

PART-A

Q.2
a) Discuss the aerobic and anaerobic process for waste water treatment. 15
b) Enumerate the advantages of anaerobic digestion of wastes over aerobic digestion. 5

Q.3
a) What are the various types of slaughter waste? Diagrammatically represent the collection segregation, transport and processing of liquid waste. 8
b) Discuss the types, material and process used for sanitary landfill. 12

Q.4
Write short notes on:
i) Industrial and hospital waste.
ii) Treatment technology for heavy metals 10x2

PART-B

Q.5
a) Describe the concepts and principles of bioremediation using microbes. Discuss its constraints. 14
b) How are the petroleum products degraded by microbes? 6

Q.6
a) Define phytoremediation. Explain one method used for phytoremediation. 14
b) Enlist the applications of phytoremediation. 6

Q.7
Justify that vermicomposting is ecofriendly technology. With the help of a flow diagram, explain the recycling of organic wastes through earthworm cultivation. 20
End Semester Examination, May 2014
B. Tech. – Sixth Semester
HUMAN GENOMICS (BT-621B)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:
   a) Differentiate between:
      i) Polygenic and pleiotropic genes.
      ii) Sex linked and limited traits. 4
   b) Explain RFLPs and SNPs. 2
   c) Explain Karyotyping. 4
   d) Discuss risks of maternal-fetal incompatibility. 4
   e) Discuss advantages and disadvantages of gene therapy. 4
   f) Explain penetrance and expressivity. 2

PART-A

Q.2 a) Discuss various aims, objectives and events in the genesis and completion of human genome project. 10
   b) Describe sex and autosomal human chromosome and diseases associated with them. 10

Q.3 Explain morbid anatomy comprising allelic disorders, malformation syndrome and onco genes. 20

Q.4 Write short notes on:
   a) DNA/RNA probes. 10
   b) Detection of genetic disorders. 2

PART-B

Q.5 a) What are pedigree analysis and its significance? 8
   b) How will you identify a person suffering from cystic fibrosis, albinism and tuberculosis? 12

Q.6 Discuss technique for the identification of criminals based on VNTR and its other applications. 20

Q.7 a) Describe genetic counseling and its significance. 6
   b) Discuss gene based therapy for disorders of cardiovascular system. 14
End Semester Examination, May 2014
B. Tech. – Sixth Semester
VIROLOGY (BT-622B)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Briefly answer the following:
   a) "Virus are unique among all living-organisms". Comment.
   b) Name two RNA-viruses.
   c) What are ribozymes?
   d) Define RIPA.
   e) How are interferons useful as antiviral?
   f) Name some nucleic acid based diagnostic techniques for virus.
   g) What are antisense RNA vectors?
   h) What do you know about binary vectors?
   i) Give the principle of confocal microscopy.
   j) Name some techniques for purification of virus.

   PART-A

Q.2 Give a detailed account of viral classification and taxonomy.

Q.3 a) How does replication differ in case of positive and negative strand RNA virus?
   b) Discuss in detail the replication and structure of a small ss DNA virus.

Q.4 Give a detailed account of in-silico approaches for drug designing.

   PART-B

Q.5 Elaborate any two of the following techniques:
   a) Flowcytometry.
   b) Western blotting.
   c) Complement fixation.

Q.6 a) What do know about "plasmid-incompatibility"?
   b) Give a detailed account of cloning in yeast through YAC.

Q.7 a) What do you understand by the term: Containment? Write in detail about the containment facilities in a virological laboratory.
   b) Enlist the basic requirements of virological laboratory.
End Semester Examination, May 2014  
B. Tech. – Sixth Semester  
DIAGNOSTIC TECHNIQUES (BT-623B)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What are fastidious bacteria?  
b) What is the use of CD markers?  
c) Mention any two common labels used in radio-immuno assay.  
d) What is the role of ‘HAT’ medium in hybridoma selection?  
e) Give example of a ‘biosensor’ based on detection of a polypeptide hormone.  
f) How are nucleic acid probes labeled?  
g) What are molecular beacons?  
h) How can we ‘identify’ carriers of a hereditary disorder?  

PART-A

Q.2  
Discuss the diagnostic characteristics of pathogenic bacteria on the basis of:  
a) Morphology and staining.  
  b) Growth medium requirements.  

Q.3  
a) Explain different kinds of antigen-antibody reactions. What is the effect of concentration of the two components of these reactions?  
  b) Characterize different kinds of immuno-globulins found in serum.  

Q.4  
a) Describe briefly the steps of an immunoassay development.  
  b) What are the parameters for qualification of an immunoassay for its clinical use?  

PART-B

Q.5  
a) Describe the method of monoclonal antibody production.  
  b) How are monoclonal antibodies diseases? Give examples.  

Q.6  
Write short notes on:  
a) Molecular signal amplification.  
  b) Restriction fragment length polymorphism.  

Q.7  
a) Elaborate any two methods of detection of mutations.  
  b) Discuss recent advances in development of vaccines using recombinant DNA technology.
End Semester Examination, May 2014  
B. Tech. – Sixth Semester  
DESIGN OF CONCRETE STRUCTURES-II (C-601)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What do you mean by continuous beams?  
b) List out advantages of flat slab.  
c) What are causes of failure of foundations?  
d) Under what conditions pile foundation is recommended?  
e) What is the purpose of bunkers and silos?  
f) Mention the important factors to be noted in the design of an R. C. tank.  
g) What is the IS code provision for providing the thickness of the wall of a tank.  
h) Concrete used for pre-stressed work should have a cube strength of ________ for post-tensioned system and ________ for pre-tensioned system.  
i) What are various types of steels used in pre-stressed concrete work?  
j) Define torsion in building.  

PART A

Q.2 a) What are the conditions under which a beam is subjected to a torsion effect? Give one example.  
b) Design an R.C. continuous beam with each span=9 m effective, carrying a slab 125 mm thick over it (slab not cast monolithically with beam). The live load over the slab may be taken as 4000 N/m² and finishes as 2500 N/m². The width of slab which transfers load to beam may be taken as 3 m. Use M₁₀ concrete and HYSD Fe 415 bars as reinforcement. Assume maximum size of coarse aggregate as 20 mm.  

Q.3 a) What are various methods of determining the bending moments in a flat slab? Explain any one.  
b) A flight of stairs to be provided in an office building is to be supported by a stringer beam on one edge and a brick wall on the other. The effective horizontal span of the stairs may be taken as 1.60 m. The rises are 150 mm and the treads are 260 mm. Design the steps allowing a live load of 3000 N/m². Use M₁₀ concrete and Fe 415 steel.  

Q.4 a) Explain different types of footings often used for various loading soil conditions.  
b) Design a footing for an R.C. wall 150 mm thick if it carries an axial load of 200 kN/m. The bearing capacity of soil may be taken as 100 kN/m². Use M₁₀ concrete and Fe 415.  

PART B

Q.5 a) With the help of neat sketch explain various joints in a water tank.  
b) Explain Airy’s theory of silo’s analysis in detail.  

Q.6 a) A simply supported pre-stressed concrete beam of rectangular cross section 300 mm X 500 mm is loaded with a total uniformly distributed load of 200 kN over  

P. T. O.
a span of 5 m. Sketch the distribution of stresses in mid span and end sections, if the pre-stressing force is 1500 kN and the tendon is eccentric located at 150 mm above the bottom fibre.

b) Compare pre-stress concrete beams with reinforced concrete beams.

Q.7 a) List various methods of analysis of portal frames. Explain any one in detail.

b) What do you mean by?

i) Flexural stiffness

ii) Ductility of beams

iii) Torsion in buildings

iv) Distribution factor

v) Relative stiffness

10 10 2x5
End Semester Examination, May 2014
B. Tech. – Sixth Semester
DESIGN OF STEEL STRUCTURES-II (C-602)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What do you mean by shape factor?
b) Define mechanism of plastic analysis.
c) What are the various types of mechanisms in portal frames?
d) Why are purlins provided in an industrial building?
e) Enumerate various elements of an industrial building.
f) What are the various types of steel water tanks?
g) Why is breech opening provided in a steel stack?
h) What are the various types of towers?
i) Define effective flange width in cold formed structures.
j) Where are cold formed structures used? 2x10

PART-A

Q.2
a) Determine the collapse load for the beam shown in the figure here \( W = wL \):

\[ \text{Diagram} \]

b) Calculate the value of shape factor for the section shown in the figure:

\[ \text{Diagram} \]

10

Q.3
Design a circular elevated water tank for a capacity of 1,00,000 litres. The tank is supported over eight columns. Also design the circular girder. Take \( M = -0.00827 \, WR \)

20

Q.4
a) Explain various components of industrial building with neat sketch.
b) The trusses for a factory building are spaced at 4.0 m centre to centre and the purlins are spaced at 1.5 m centre to centre. The pitch of the truss is \( \frac{1}{4} \) and the span of the roof is 8.0 m. The vertical load from roof sheets etc. are equal to 180 N/m² while the wind load on roof surface normal to the roof is equal to 1200 N/m². Design:
i) 1-section purlins    ii) Angle purlins
Take = \( \sigma_{M} = 165 \, N/mm^2 \)  

12

P. T. O.
Q.5 Design for Delhi a self supporting chimney of height 50 m above the foundation. The diameter of cylindrical part is 2.5 m, thickness of brickwork lining is 100 mm. The topography is flat and location is of terrain category 2.

Q.6  
(a) Define lattice tower and explain various types of bracings used in it with a neat sketch.
(b) What are the various loads considered in the design of lattice towers? Explain the calculation of wind loads.

Q.7  
(a) Differentiate between stiffened and unstiffened compression members with a neat sketches.
(b) Find the allowable load for the rectangular tubular column section shown in the figure. The effective length of column is 4.0 m. Take $f_y = 250 N/mm^2$.

Note: Table for the value of $K_2$-Factor is given below:

<table>
<thead>
<tr>
<th>Height (m)</th>
<th>Terrain Category 1</th>
<th>Terrain Category 2</th>
<th>Terrain Category 3</th>
<th>Terrain Category 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>A</td>
<td>B</td>
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<td>1.34</td>
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Note: Interimete values may be obtained by linear interpolation. It is permissible to assume constant wind speed between two heights, for simplicity.

Structure size: Buildings or structures are classified into the following three different classes depending upon their size (i.e., greater horizontal or vertical dimension).
End Semester Examination, May 2014
B. Tech. – Sixth Semester
IRRIGATION ENGINEERING-II (C-603)

Time: 3 hrs
Max Marks: 100
No. of pages: 3

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Describe briefly the following:
   a) Relevance of Laplace equation.
   b) Four features of Sarda fall.
   c) Relevance of pond level in weir design.
   d) Calculations for exit gradient.
   e) Use of ogel spillway.
   f) Necessity of filter drain in earth dams.
   g) Middle third rule in concrete dams.
   h) Five forces acting on concrete dams.
   i) Necessity of guide banks.
   j) Syphon aqueduct and its sketch.

   2x10

PART A

Q.2 a) What is the difference between a weir and barrage and why we prefer the later? 4
   b) A weir is to be designed across a river with following data:
      i) High flood discharge = 2300 m$^3$/s
      ii) Silt factor = 0.9
      iii) Average bed level of the river = 256.0 m
      iv) High flood level = 260.60 m
      v) Pond level = 259.70 m
      vi) Afflux = 0.75 m, Regression = 0.30 m
      Calculate the following parameters:
      i) Lacy’s waterway
      ii) Velocity of flow
      iii) T.E.L. after construction of weir u/s and d/s.
      iv) Design of undersluice, spans of weir and crest level of weir,
      v) Scour depth
      vi) Bed levels of cutoff walls
      vii) Critical depth of flow over the weir.
   c) Draw a complete sketch of the cross-sectional view of the weir including inverted filter and launching apron. Assume any other data not given above. Show the dimensions and levels properly. 6

   10

Q.3 a) Develop the general equation of flow over the spillway of the storage dam i.e.

   \[ dT = \int \frac{A \, dH}{Q - kH^{3/2}} \] 4

   b) Surface area of a reservoir at full level is 36 lac m$^2$. The flow over the spillway is given by the equation \( q = 56 \, H^{3/2} \). The inflow discharge of the river at the entry point of reservoir is given as below:

   \[
   \begin{array}{c|cccccc}
   T (hrs) & 0 & 4 & 8 & 12 & 16 & \\
   Q (m^3/s) & 0 & 500 & 1000 & 1500 & 1000 & \\
   \end{array}
   \]

   4

P. T. O.
Calculate the values of discharge passing over the spillway and draw the
hydrograph.

Q.4 a) Define a cross-drainage work. Name four types of cross-drainage works along with
sketches.

b) Design a siphon aqueduct with following data:
   Canal:  i) Discharge = 35 cumecs
   ii) Bed width = 24 m
   iii) Depth of water = 1.8 m
   iv) Bed level of the canal level at the end of the structure = 230.00 m
   v) Width of concrete channel = 12.0 m
   Drain:  i) High flood discharge = 850 m³/s
   ii) High flood level = 231.30 m
   iii) Bed level = 227.60 m
   iv) General ground level = 230.00 m

Calculate total energy levels, full supply levels and bed levels of the canal at four
cross-sections and sketch the longitudinal cross-section of the canal. Also sketch the
cross-sectional view of the aqueduct showing all the levels.

PART-B

Q.5 a) Name four types of spillways. When do we adopt ogee spillway and what is its
special feature? Give sketch.

b) An ogee spillway is to be designed with following data:
   Q=8500 m³/s crest level = 205.00 m, Average bed level of river = 100.00 m,
   spillway length consists of 6 spans of 10 m each. Thickness of each pier = 2.5 m,
   downstream slope = 0.75:1
   Calculate the following:
   i) Effective length of spillway with kₚ=0.01, kₗ=0.1
   ii) Corrected depth of water (H₉) over the spillway
   iii) Value of y at dy/dx=1/0.75
   iv) Ordinates y at x=0,5,10,15,20
   v) Coordinates of x, y on left side of crown
     x = 0.27 H₉, y = x/2

   Sketch the cross-section of the spillway and the dam showing all the
dimensions and levels.

Q.6 a) Describe the necessity of falls with sketch.

b) Explain main difference in the system of energy dissipation in Sarda fall and
Sloping Glacis Fall. Give proper sketches of the two.

c) Give the complete design of Sarda Fall on a channel with following data:
   i) Discharge = 23 cumecs,
   ii) Bed width = 18.0 m
   iii) Depth of flow = 1.55 m

d) Give complete sketch of the Fall (cross-sectional view) with levels and dimensions.

Q.7 a) When do we provide a concrete dam? Give the impact of:
   i) Silt pressure
   ii) Wave pressure
   iii) Ice pressure

   2x3
b) Figure shows the cross-section of concrete gravity dam. Calculate the stresses at the heel and toe of the dam. The rock below is permeable and is subjected to uplift pressure reduced to H/3 at the drainage gallery. Apply middle third rule for calculating the stresses.
End Semester Examination, May 2014
B. Tech. – Sixth Semester
TRANSPORTATION ENGINEERING-II (C-604)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) List components of flexible pavements.
b) Define California bearing ratio.
c) What is function of dowel bars?
d) What is the purpose of providing expansion joints in a pavement?
e) Name various types of highway construction.
f) What are functions of bituminous surface dressing.
g) Define resisting length.
h) If radius of wheel load distribution (a) = 15 cm and slab thickness (h) = 20 cm; find out equivalent radius of resisting section (b).
i) Why highway drainage is important?
j) Mention various sections of tunnels. 2x10

PART-A

Q.2  
a) A subgrade soil sample has the following properties:
   Soil passing 0.075 mm sieve = 60%, Liquid limit = 55%, Plastic Limit = 45%.
   Design the pavement section by G.I. method for heavy traffic with over 400 commercial vehicles per day.
b) Enumerate the various methods of flexible pavement design. Briefly indicate the basis of CBR method. 10

Q.3  
a) Explain the design of joints in cement concrete pavements.
b) Discuss the critical combination of stresses due to wheel load and temperature stresses. 10

Q.4  
a) Specify the materials required for construction of WBM roads. What are the uses and limitations of this road?
b) Discuss the scope of soil stabilization in road construction. 10

PART-B

Q.5  
a) What are the materials required, plants and equipment, and construction steps for surface dressing?
b) Write short note on any two:
i) Tack coat
ii) Premix carpet
iii) Mastic asphalt 5x2

Q.6  
a) What are the requirements of a good highway drainage system?
b) Discuss the maintenance problems in hill roads. 10

Q.7  
a) Explain full face method of tunneling. What are its advantages?
b) What are different sections of tunnels? Discuss suitability of each section. 10

P. T. O.
## DESIGN OF HIGHWAY PAVEMENTS

### Table

<table>
<thead>
<tr>
<th>Surface Evaluation of Subgrade</th>
<th>Group Index of Subgrade</th>
<th>Daily Volume of Com. Traffic</th>
<th>Surface and Base Thickness (cm)</th>
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<td>0-1</td>
<td>Light (less than 500)</td>
<td>Base and sub-base thickness</td>
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<tr>
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<td>Medium (50-300)</td>
<td>Mix with volume of</td>
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<tr>
<td>Fair</td>
<td>2-4</td>
<td>Heavy (more than 300)</td>
<td>Space traffic and</td>
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<td>Poor</td>
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<td></td>
<td>Select sub-base</td>
</tr>
<tr>
<td>Very Poor</td>
<td>6-10</td>
<td></td>
<td>Thickness, vary</td>
</tr>
</tbody>
</table>

### Diagram

- Combined thickness of surface, base and sub-base
- Thickness of surface and base

**Design Chart by Group Index value**
End Semester Examination, May 2014
B. Tech. – Sixth Semester
ENVIRONMENTAL ENGINEERING (C-605)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What is air pollution?
   b) What is a plume?
   c) What is aerobic decomposition?
   d) What is a bin?
   e) Write a Chezy's formula.
   f) What do you understand by DWF?
   g) What is the ratio of 5-days BOD to ultimate BOD?
   h) What is decomposition?
   i) Why is it necessary to remove the grease and oils from sewage?
   j) What is eutrophic? 2x10

PART-A

Q.2 a) Explain various types of air pollution with examples. Write in detail about sources of air pollutants and its effects.
   b) Determine the rise and effective height of the stack for the following data:
      i) Physical stack height = 150 m
      ii) Inside diameter of stack at exit = 1 m
      iii) Wind velocity = 3.5 m/s
      iv) Air temperature = 25° C
      v) Barometric pressure = 950 million
      vi) Stack gas exit velocity = 12.5 m/s
      vii) Stack gas exit temperature = 150° C
   c) What are objectives of using air pollution control equipments? State some pollution control equipments.

Q.3 a) What is sanitary landfill? Why is it so important today in India? How as a civil engineer you will plan for sanitary landfill?
   b) In a solid waste management system per capita solid waste under house to house collection system is 400 gm/day. Given that the density of solid waste is 550 kg/m³. Design the size and number of pedal tri-cycle. Consider population of each ward to be 10,000.

Q.4 a) Calculate the velocity and discharge through a rectangular concrete lined smooth channel 2.5 m wide and 1.5 m deep built to a slope of 1 in 200 when running completely full. Use Bazin's co-efficient in Chezy's formula.
   As \( C = \frac{157.6}{k} \) where \( k = 0.3 \) for smooth concrete lined surface.
   \( \sqrt{R} \)
   b) What are various sewerage systems used in field along with advantages?
   c) Write short notes on:
      i) Ground water infiltration.
      ii) Grade or slope of sewer line.
      iii) Flushing tank.
      iv) Street inlets.

2½x4

P. T. O.
PART-B

Q.5  a) Explain nitrogen cycle and phosphorus cycle along with neat sketches.  
      10
b) Differentiate between oxygen demand and biochemical demand. How do you 
   determine BOD? What are the limitations of BOD?  
   5
 c) The 5-days BOD (20° C) of a sewage sample was found to be 100 mg/l. Calculate  
   2-days BOD at 30° C for the same sample. Take Ks=0.1 /day.  
   5

Q.6  a) What is proportional flow weir? How do you determine the geometry of such a 
      weir? Draw a neat sketch.  
      10
b) What do you understand by preliminary treatment of waste water? Enumerate 
   various unit operations falling under this. Also draw flow diagrams for the possible 
   arrangements of various units under preliminary treatment.  
   10

Q.7  a) How the eutrophication of lakes occurs? What are major problems associated with 
      entrophication?  
      10
b) Discuss the general physic-chemical effects of pollutions in water bodies. Give some 
   preventive measures to control eutrophication.  
   10
End Semester Examination, May 2014
B. Tech. – Sixth Semester
MICROWAVE ENGINEERING (EC-701A)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Guide wavelength in a wave guide is always greater than the free space wave length. Justify the statement.
b) Write down any two properties of scattering matrix.
c) What are active and passive microwave components? Give examples.
d) Differentiate between ‘degenerate’ and ‘dominant’ mode in a wave guide.
e) If the peak power of a radar is increased by 16 times, by what factor the radar range will increase. 4x5

PART-A

Q.2 a) What are advantages of microwaves over low frequencies? Write their draw backs also. 10
b) What are major applications of microwaves? 10

Q.3 An air filled rectangular waveguide has dimensions a = 6 cm and b = 4 cm. For TE_{10} mode, compute the following:
a) Cut-off frequency.
b) Wavelength in waveguide.
c) Phase constant and phase velocity.
d) Group velocity and wave impedance in waveguide. 20

Q.4 a) What is a circulator? Discuss its theory of operation and suggest at least three applications in practice. 10
b) What do you mean by E-plane Tee and H-Plane tee? Compare their propagation characteristics. 10

PART-B

Q.5 a) What are the limitations of conventional vacuum tubes for use at microwave frequencies? Briefly discuss each limitation. 10
b) Discuss the conditions for sustained oscillations in a reflex klystron. How frequency of oscillation is varied in this device? 10

Q.6 a) How oscillation takes place in Gunn diode? Discuss in details. 10
b) Describe physical structure of TRAPATT diode and explain its principle of operation. 10

Q.7 Write short notes on any two:
a) Block diagram and operation of radar.
b) Measurement of microwave frequency.
c) Measurement of microwave power. 10x2
End Semester Examination, May 2014
B. Tech. – Sixth Semester
RADAR ENGINEERING (EC-721)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define range resolution.
b) What should be the pulse repetition frequency of radar in order to achieve a maximum unambiguous range of 60 nmi?
c) Define threshold detection.
d) In which case maximum radar range occurs?
e) What is Doppler frequency shift for stationary targets?
f) Define integration of pulses.
g) What is the disadvantage of lobe-switching as compared to mono-pulse scanning?
h) Define duty cycle.
i) Define maximum unambiguous range.
j) What is the function of duplexer? 2x10

PART-A

Q.2  
a) Explain the application of radar for their corresponding frequency bands. 10
b) Explain principle and operation of a radar system in detail. What is intermediate frequency? 10

Q.3  
a) What factors determine the maximum possible range of a radar? Illustrate with the help of an expression which is in your opinion the most dominating factor and why is it so? 10
b) Write short notes on:
   i) Propagation effects.
   ii) Signal processing losses. 5x2

Q.4  
a) Draw the block diagram of a CW radar. Write its disadvantages. 10
b) Explain the principle and operation of a multiple frequency CW radar. 10

PART-B

Q.5  
a) Draw the block diagram of an MTI radar and explain how the 'COHO' signal is locked in phase with transmitted signal. 10
b) Explain what is the basic difference between MTI and a pulse doppler radar? List the advantages and disadvantages of range gating. 10

Q.6  
a) How does track-while-scan operate? In what way it is a compromise? 10
b) With the help of neat diagrams, explain the sequential lobbing tracking radar technique. What is the disadvantage of lobe switching as compared to mono-pulse scanning? 10

Q.7  
a) Define receiver noise figure. Give the noise figure of networks in cascade. 10
b) Write a short note on SONAR. 10
End Semester Examination, May 2014  
B. Tech. – Sixth Semester  
OPTICAL COMMUNICATION (EC-723A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define the term: refractive index of a material.  
b) Mention the frequency ranges for visible spectrum.  
c) What is numerical aperture of an optical fibre and how is it related to normalized difference \( \Delta \)?  
d) Classify the optical fibres depending on material used in manufacturing fibre optic cables.  
e) What are ray theory and wave theory for an optical fibre?  
f) Define recombination process for LEDs.  
g) Diagrammatically show how LEDs are coupled with a fibre.  
h) Enlist few system design considerations for optical fibre communication systems.  
i) What are photo transistors and photo conductors?  
j) What do you understand by population inversion? Support your answer with a suitable diagram.  

\( 2\times10 \)

PART-A

Q.2  a) Suppose a laser diode diode radiates red light with \( \lambda = 650 \text{ nm} \). Then what is the energy of single photon?  
b) Describe the functions of core and cladding in an optical fibre. Why are their refractive indices different? Which one has to be greater and why?  
c) Draw the electromagnetic spectrum for communication systems.  

\( 5 \)  

Q.3  a) For a specific fibre NA=0.275 and \( n_{\text{core}} = 1.4 \). Find the critical propagation angle.  
(\( n_{\text{core}} \) is refractive index of core)  
b) List three major causes of attenuation in an optical fibre and explain their mechanisms.  

\( 5 \)  

\( 15 \)

Q.4  a) Differentiate between homostructure and heterostructure LEDs with the help of suitable diagrams for each category.  
b) What are internal and external quantum efficiencies? Derive an expression for internal quantum efficiency showing its relationship with power generated internally Pint to the LED.  

\( 10 \)

PART-B

Q.5  a) What are the features of good optical source?  
b) Briefly explain the working of distributed feedback lasers with a suitable diagram.  
c) Differentiate between spontaneous and stimulated emissions for optical sources.  

\( 5 \)  

\( 10 \)

Q.6  a) Define the term responsivity for photodetectors and derive the equation for it.  
b) Explain the working of PIN photodiodes.  

\( 10 \)

Q.7  Write short notes on:  
a) Intensity modulation.  
b) Power budgeting of optical systems.  
c) Wavelength division multiplexing of light signal.  
d) Fibre couplers and fibre connectors.  

\( 5\times4 \)
End Semester Examination, May 2014  
B. Tech. – Sixth / Seventh Semester  
COMPILER DESIGN (CS-701)

Time: 3 hrs  
Max Marks: 100

No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  

a) What is activation record? Explain its structure.

b) Explain LEX in detail.

c) Distinguish between static and dynamic scope.

d) What is left recursion? Eliminate left recursion from the grammar:

\[ S \rightarrow AB | aC | SD | Se \]
\[ B \rightarrow bBC | F \]
\[ C \rightarrow g \]

e) What is loop optimization?  

4x5

PART-A

Q.2  

a) Explain different parameter transmission schemes with examples.  

10

b) What do you mean by sequence control? Explain various sequence control techniques.  

10

Q.3  

a) Explain the input buffering scheme for scanning the source program.  

10

b) Construct NFA for \( ab(a | b)^* a^* \) and also construct minimized DFA from the NFA using \( \epsilon \)-closure mechanism.  

10

Q.4  

a) Verify whether the following grammar is SLR (1):

\[ S \rightarrow L = R \]
\[ S \rightarrow R \]
\[ L \rightarrow * R \]
\[ L \rightarrow id \]
\[ R \rightarrow L \]

10

b) Define operator precedence grammar. Compute operator precedence relations for the grammar:

\[ S \rightarrow a | b | (T) \]
\[ T \rightarrow T, S | S \]

10

PART-B

Q.5  

a) What is syntax directed translation scheme? Give the parse tree for the expression \( 23*5+4S \) using the following scheme:

\[ S \rightarrow E$ \]
\[ E \rightarrow E(0) + E(2) \]
\[ E \rightarrow E(0) * E(2) \]
\[ E \rightarrow E(0) \]
\[ E \rightarrow i \]
\[ I \rightarrow I(0) \_ \text{digit} \]
\[ I \rightarrow \text{digit} \]

\{ \text{print E.val} \}
\{ E.\text{VAL} = E(0).\text{VAL} + E(2).\text{VAL} \}
\{ E.\text{VAL} = E(0).\text{VAL} * E(2).\text{VAL} \}
\{ E.\text{VAL} = E(0).\text{VAL} \}
\{ E.\text{VAL} = I.\text{VAL} \}
\{ I.\text{VAL} = 10*I(0).\text{VAL} + \text{LEXVAL} \}
\{ I.\text{VAL} = \text{LEXVAL} \}

10

P. T. O.
b) What are various types of intermediate code representations?  

Q.6  

a) What is a symbol table? Explain the contents of a symbol table. Explain how hash tables are used for storage in a symbol table.  

b) Explain various semantic phase errors and their error recovery techniques.  

Q.7  

a) What is DAG? Write its applications. Construct DAG for the following basic blocks:

\[
\begin{align*}
D &= B \times C \\
E &= A + B \\
B &= B \times C \\
A &= E - D
\end{align*}
\]

b) Explain various issues in code generation. Generate the code sequence for the following:

\[
\begin{align*}
T &= A - B \\
U &= A - C \\
V &= T + U \\
W &= V + U
\end{align*}
\]
End Semester Examination, May 2014
B. Tech. – Sixth / Seventh Semester
SOFTWARE DEVELOPMENT PROCESSES (CS-702)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Discuss the concept of inheritance using an example.
    b) What is UML used for?
    c) What are transitions?
    d) What is a role name?
    e) What is the difference between association and aggregation?
    f) What are activities?
    g) When do we need to split the classes in model refinement?
    h) Explain implementation view of system architecture.
    i) Why do we add classes to the model?
    j) What are the components of a sequence diagram? 2x10

PART-A

Q.2 a) What is a model? Why is modeling required? 10
    b) Discuss the spiral model of software development highlighting its advantages and disadvantages. 10

Q.3 a) What are 'Include' and ‘Extend’ relationships in use case diagram? Draw a use case diagram for flight reservation system. 10
    b) Draw an activity diagram for online shopping system. 10

Q.4 a) What are stereotypes? What is a package? Explain. 10
    b) Draw a class diagram for voting system. 10

PART-B

Q.5 a) What is scenario? Explain using examples. 10
    b) What is an association class? Explain 10

Q.6 a) Explain the 4+1 architecture view of system design. Discuss the importance of each view. 12
    b) Explain the scenario walkthrough mode of model refinement. 8

Q.7 Write short notes on:
    a) Designing attributes and operations 6
    b) Reverse engineering 6
    c) Coding and testing the iteration 8
End Semester Examination, May 2014
B. Tech. — Sixth / Seventh / Eighth Semester
SYSTEM PROGRAMMING AND SYSTEM ADMINISTRATION (CS-703)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is the difference between a macro and a function?
b) What is dynamic loading?
c) Explain the debug monitors.
d) Explain overlays.
e) What are inodes in UNIX?
f) Give five shell variables.
g) Define system software with examples.
h) How can you sort files in UNIX?
i) Differentiate between absolute and relative path names in UNIX.
j) Give five wildcards of UNIX.

2x10

PART-A

Q.2
a) What are different system software components? Give some software tools used for support of system software.
b) What is macro language and macro instructions? Explain conditional macro expansion and macro call within macro with a suitable example.

10
10

Q.3
a) What are mnemonics in assembly language? Define pass1 of assembler along with all data structures required in pass1.
b) Explain different functions of a loader. How can a direct linking loader overcome the limitation of a relocating loader?
c) What is linking?

10
8
2

Q.4
a) Explain the directory structure of UNIX OS. What are different blocks associated with file system?
b) What is UNIX command structure? Give examples of six UNIX commands.

12
8

PART-B

Q.5
a) What is UNIX shell programming construct? Write a shell program to find out permission granted on a file where input is provided by user.
b) What is interactive shell script? Give commands to compare and sort the files and write the output also.

10
10

Q.6
a) Explain the booting process in UNIX.
b) Perform the following operations:
i) To create a user and its user group
ii) To modify home directory of user
iii) To kill a process forcefully.
iv) To increase the nice value of a process.
v) To stop background process.

10
2x5

Q.7
a) Write short notes on:
i) Application software
ii) Device drivers
iii) Virus control management
iv) Operating system.

5x4
End Semester Examination, May 2014
B. Tech. – Sixth / Seventh Semester
NETWORK SECURITY AND MANAGEMENT (CS-721)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are replay attacks? Give an example of replay attacks.
    b) What is the purpose of S-boxes in DES?
    c) What is the difference between a block cipher and a stream cipher?
    d) What is authentication? Give an example.
    e) Write down drawbacks of symmetric key cryptography.
    f) Explain ESP in IPsec architecture.
    g) What do you mean by intrusion detection?
    h) What are major improvements in SNMP V2 over SNMP V1?
    i) What do you mean by Trojan-horse?
    j) What is a transposition cipher? Explain with an example.

2x10

PART-A

Q.2 a) Explain OSI security architecture in detail with an example.
    b) Explain rotor machines in detail with a diagram.

15

Q.3 a) Compare CBC mode with CFB mode in terms of encryption operation needed to transmit a large file. Which one is better and why?
    b) What is the idea behind meet-in-the-middle attack? Explain with a diagram.
    c) Show that DES decryption is, in fact, the inverse of DES encryption. Explain with a suitable example.

10

Q.4 a) Explain RSA algorithm in detail with an example.
    b) What are the three broad categories of applications of public key crypto-system?
    c) Describe the advantages and disadvantages of symmetric and asymmetric key cryptography.

15

PART-B

Q.5 a) What do you mean by firewall? Explain characteristics of a good firewall in detail.
    b) What do you mean by intrusion detection? Explain various approaches to intrusion detection.
    c) What do you mean by honeypots? Explain with an example.

10

Q.6 a) What do you mean by IP security? What are its advantages? Explain its architecture in detail.
    b) Why SHA is more secure than MDS? Explain with a suitable example.

15

Q.7 Write short notes on any two:
    a) ATM
    b) TMN information model
    c) RMON

10x2
End Semester Examination, May 2014
B. Tech. – Sixth / Seventh / Eighth Semester
SOFTWARE TESTING (CS-723)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) State the objective of testing a program.
   b) Describe bug life cycle with a neat diagram.
   c) State difference between functional testing and structural testing in a table.
   d) Define and explain software errors. Support with an example.
   e) Write a short note on measures of software reliability and availability. 4x5

PART-A

Q.2 a) Describe performance testing and regression testing. 8
   b) Perform a complete first cycle of testing for the following program:
      The program is designed to add two numbers which you enter. Each number
      should be one/two digits. The program will echo your input entries, then print the
      sum. To start the program type ADDER. (Draw neat screen outputs) 12

Q.3 a) What is a software bug? Explain how bugs are introduced into the software. State
      the effects of bugs using a live example/instance. 10
   b) What is a problem report? Draw a general problem report form and explain its
      contents. 10

Q.4 a) What are the objectives of problem tracking system? State its purpose and who
      are its users? Support by a real-life example. 10
   b) Explain the mechanics of a system database. 10

PART-B

Q.5 a) Describe visible state transition. Support with an example. What is the role of
      testers here? 5
   b) Describe the characteristics of a good black-box test case. 5
   c) A program reads an integer number within the range [50, 150] and determines
      whether it is a prime number or not. Design a test case for this program using
      BVC, robust testing and worst-case testing methods. 10

Q.6 a) Differentiate between manual and automated testing in a table form. 8
   b) Write a short note on load runner. 4
   c) Explain translucent box testing. 8

Q.7 a) Describe software quality control, quality assurance and cost of quality. 10
   b) Draw and discuss the defect amplification model supported by example of no
      reviews. 10
End Semester Examination, May 2014
B. Tech. – Sixth Semester
DIGITAL SIGNAL PROCESSING (EE-601)

Time: 3 hrs
Max Marks: 100
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What do you mean be linear time invariant system? Test the following signal for linearity and time-invariance: \( y(n) = n x(n) \).
   b) Determine whether or not the following signal is periodic. In case of the periodic signal, specify the fundamental period: \( x(n) = 3 \cos (6n + \pi/8) \).
   c) Differentiate between linear and circular convolution.
   d) Determine the minimum required sampling rate to avoid aliasing for the analog signal: \( x_a(t) = 2 \sin (360\pi t) + 3 \sin^2(600\pi t) \).
   e) State and prove time reversal property of Fourier transform.
   f) Differentiate between FIR and IIR filters.
   g) By impulse invariant method obtain the digital filter transfer function of analog filter, \( H(s) = \frac{1}{s+1} \).
   h) What is an interpolator?
   i) Mention the features of a DSP processor.
   j) What are the effects of finite word length in digital filters? 2x10

PART-A

Q.2 a) Find Fourier transform of the following signal: \( x(n) = n u(n) \).
   b) Determine the impulse response of the following causal system: \( y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1) \).
   c) Using long division, determine the inverse Z-transform of:
      \[ x(z) = \frac{2 - 1.5 z^{-1}}{1 - 1.5 z^{-1} + 0.5 z^{-2}} \] if
      i) \( x(n) \) is causal
      ii) \( x(n) \) is anti-causal 10

Q.3 a) Compute the DFT of the sequence: \( x(n) = \{0, 1, 2, 3\} \). Sketch the magnitude and phase spectrum. Take \( N=8 \).
   b) Find the linear convolution of \( x(n) = \{-1, 3, -5, -7, 9, -11\} \) with \( h(n) = \{-4, 8, -16\} \) using circular convolution. 10

Q.4 a) Explain the design of FIR filter using frequency sampling technique.
   b) What is the condition for linear phase in FIR filters?
   c) What is Gibb's phenomenon? Explain its consequences. 5

PART-B

Q.5 a) Explain how an IIR filter can be designed using bilinear transformation method.
   Convert analog filter: \( H(s) = \frac{2}{(s+1)(s+2)} \) into digital filter by means of bilinear transformation, \( T=1 \) sec. 15

P. T. O.
b) What is frequency warping? Discuss influence of warping effect on amplitude response and phase response of a derived digital filter from a corresponding analog filter.

Q. 6 a) How will you obtain digital filters from analog filters? 
    b) Explain the need for multi-rate signal processing. Why the filters designed for multi-rate systems are named polyphase filters?

Q. 7 a) Explain in detail the architecture of a DSP processor. 
    b) List out various applications of a DSP processor.
End Semester Examination, May 2014  
B. Tech. – Sixth Semester  
DIGITAL SIGNAL PROCESSING (EE-601A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Plot the following signal:  
\[ x(n) = u(n) - u(n-1) \]  
b) State and prove time scaling property of Fourier transform.  
c) Test linearity and stability of the system:  
\[ y(n) = Ax(n) + B \]  
d) Find convolution of the sequences:  
\[ x_1(n) = [1, 2] \text{ and } x_2(n) = [1, 0, 1, 1] \]  
e) List the difference between FIR and IIR digital filters.  
f) What are the desirable characteristics of windows used for designing FIR filters?  
g) Draw and explain direct form-I structure for IIR filters.  
h) What are the effects of finite precision arithmetic on a digital filter?  
i) Compute the DFT of the given sequence:  
\[ x(n) = [-2, 2, 1, -1] \]  
j) Explain how a DSP processor is different from a normal microprocessor.  

**PART-A**

Q.2  
a) State and prove time reversal property of z-transform. Using this property, find the  
z-transform of:  
\[ x(n) = \left( \frac{1}{2} \right)^n u(-n) \]  

b) Find the inverse z-transform of:  
\[ X(z) = \frac{z}{3z^2 - 4z + 1} \]  
where the ROC is  

i) \(|z| > 1\)  
ii) \(|z| < \frac{1}{3}\) using the long division method.

Q.3  
a) Compute the response of the system  
\[ y(n) = 0.7y(n-1) - 0.12y(n-2) + x(n-1) + x(n-2) \]  
to the input  
\[ x(n) = nu(n) \]. Is the system stable?  

b) Compute the cross correlation between:  
\[ x(n) = \left[ \begin{array}{c} 1 \\ 1 \\ 0 \\ 1 \end{array} \right] \text{ and } y(n) = \left[ \begin{array}{c} -4 \\ -3 \\ -2 \\ 1 \end{array} \right] \]  

Q.4  
a) Draw and explain the stagewise flow graph for radix-2 decimation in time –FFT algorithm for N=8.  

b) How will you obtain linear convolution from circular convolution? Explain with an example.

**PART-B**

Q.5  
a) Explain the frequency sampling method used for design of FIR filter. Design a low  
pass digital filter with cutoff frequency  \( \omega_c = \frac{\pi}{2} \) using frequency sampling method  
for N=7.  

b) Justify the statement: FIR filters are linear phase filters.

P. T. O.
Q.6  

a) Convert an analog filter whose system function is 
\[ H(s) = \frac{s + 0.1}{(s + 0.1)^2 + 16} \] 
using bilinear transform which is resonant at \( \omega_r = \frac{\pi}{2} \).  \[ \text{10} \]

b) What are the characteristics of Butterworth filters? \[ \text{5} \]

c) What is zero input limit cycle in IIR filters? Explain it with one example. \[ \text{5} \]

Q.7  

a) What is multirate signal processing? Explain the up-sampling in detail with necessary derivations. \[ \text{15} \]

b) Write a short note on FIR digital filter banks. \[ \text{5} \]
Q.1 a) State essential parts of an electric drive.
b) What do you understand by constant torque drive and constant power drive?
c) What are the applications of a cycloconverter?
d) Draw speed torque characteristics of a DC separately excited motor.
e) What is a dual converter?
f) What are various control strategies of a chopper?
g) Why V/f is maintained constant for speed below base speed?
h) Compare VSI and CSI.
i) Why static Kramer drive has low range of speed control?
j) What are various method used for speed control of synchronous?

PART-A

Q.2 a) Explain multiquadrant operation of an electric drive.
b) Draw the block diagram of electric drive. Explain the function of each component of electric drive in detail.
c) Explain the phase locked loop in detail with help of a block diagram.

Q.3 Describe the working of single phase to single phase step down cycloconverter for continuous conduction for bridge type cycloconverter. Illustrate your answer with help of a wave form. Also determine output voltage expression of cycloconverter.

Q.4 a) Explain working of single phase fully controlled rectifier control of DC separately excited motor in continuous conduction mode.
b) A 220 V, 1500 rpm, 10 A separately excited dc motor is fed from single phase fully controlled rectifier with an ac source voltage of 230 V, 50 Hz, R_s=2Ω. Conduction can be assumed to be continuous. Calculate firing angle for:
i) Half the rated motor torque and 500 rpm.
ii) Rated motor torque and (-1000) rpm.

PART-B

Q.5 a) Discuss the working of four-quadrant chopper fed dc drive.
b) Explain how the speed of a dc series motor is controlled with help of a chopper.

Q.6 a) Explain the voltage source inverter control of an induction motor.
b) Explain the variable frequency control of an induction motor in detail.

Q.7 What do you understand by slip power recovery schemes? Explain the slip power recovery schemes of speed control in detail.
End Semester Examination, May 2014
B. Tech. – Sixth Semester
POWER SYSTEM-II (EE-603)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What are components of a power system?
b) How loads are represented in a reactance diagram?
c) What is main difference in representation of a power system for load flow studies and short circuit studies?
d) What is bus admittance matrix?
e) Which method is more accurate for load flow problem and why?
f) What is the relationship between loop impedance and admittance matrix?
g) What are the causes of overvoltage surges?
h) What are the types of surge diverters?
i) What are the different types of shunt compensation?
j) Write full form of FACTS.

PART-A

Q.2
Explain the formation of Zbus matrix using different types of modifications.

Q.3
a) Explain the power system representations with mathematical expressions for:
   i) Synchronous machine.
   ii) Transmission line.
b) For figure shown below find the p.u. values and draw its reactance diagram:

   ![Diagram]

   Gen-1  30 MVA, 10.5 kV, X" = 1.60 ohms
   1  15 MVA, 6.6 kV, X" = 1.20 ohms
   3  25 MVA, 6.6 kV, X" = 0.56 ohms
   Transformer T1 15 MVA, 33/11 kV, X= 15.20 ohms/kW
   T2 15 MVA, 33/6.2 kV, X= 160 ohms/kW
   Transmission line 20.5 ohms/kW
   Load A 40 MW, 11kV 0.9 lagging p.f.
   B 40 MW, 6.6 kV, 0.85 lagging p.f.

Q.4
a) Write the algorithm for finding solution of power flow problem using Gauss-Seidal methods.
b) Draw Ybus for the following diagram:

   ![Diagram]

   All impedances are in p.u. values.

P. T. O.
**PART-B**

Q.5   a) What is difference between fast decoupled and Newton Raphson methods? 5  
      b) Write the flow chart to find load flow solution for power system network using fast decoupled Newton Raphson method. 15

Q.6   a) What is statcom? Explain its working. 5  
      b) Explain the basic principle of shunt compensation and types of shunt compensation. 15

Q.7   a) Describe the construction and principle of operation and applications of:  
      i) Rod gap.  
      ii) Expansion gap.  
      iii) Valve type lightning arrestors. 20
End Semester Examination, May 2014
B. Tech. – Sixth Semester
POWER SYSTEM-II (EE-603A)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define primitive network.
b) What are the various shunt facts controllers?
c) What is admittance metrics?
d) Write load power flow equation.
e) What are the advantages of fast decoupled method over Newton Raphson method of power flow problem?
f) What is basic function of automatic voltage regulator?
g) Explain the function of load frequency control.
h) What is transient stability?
i) What are the components used to represent a power system network?
j) What are assumptions commonly made in stability studies?  2x10

PART-A

Q.2  
a) Explain the power system representation of three phase power system network.  10
b) Draw the reactance diagram for given single line diagram.

![Diagram]

Q.3  
a) Draw the graph and for incidence matrix for given figure of power system network.

![Diagram]

b) How to determine \( Y_{bus} \), \( Z_{bus} \) by graph theory for a power system network? Explain with an example?  10

P. T. O.
Q.4  
a) For a given power system, build $Y_{bus}$ matrix. The branch impedance of lines are as follows:

![Diagram]

\[ \begin{align*}
1-2 \rightarrow (10+j 40) \Omega & \quad 2-3 \rightarrow (5+j 25) \Omega \\
1-4 \rightarrow (15+j 50) \Omega & \quad 3-4 \rightarrow (10+j 30) \Omega \\
2-4 \rightarrow (15+j 20) \Omega & 
\end{align*} \]

b) Write the algorithm to solve power flow solution using Newton Raphson method.

10

PART-B

Q.5  
Draw the schematic diagram of load frequency control and automatic voltage regulator. And explain the function of each block.

20

Q.6  
a) Derive the serving equation for power system stability.

10

b) Explain equal area criterion for sudden increase in power input for stability.

10

Q.7  
Explain in detail the following facts controllers:

a) Series controllers.

10x2

b) Shunt controllers.
End Semester Examination, May 2014
B. Tech. – Sixth Semester
HIGH VOLTAGE ENGINEERING (EE-621 / EE-621A)

Time: 3 hrs  \hspace*{1cm} \text{Max Marks: 100}
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Name different breakdown mechanisms in solid dielectrics.
    b) Define basic impulse level.
    c) Define time to front of an impulse voltage waveform.
    d) What is the level of electrical field developed within clouds before a lightning stroke occur?
    e) What is the purpose of insulation co-ordination?
    f) Which type of surge diverters is used for overvoltage protection in EHV and UHV systems?
    g) State Paschen’s law.
    h) Give any two biological and environmental effects of EHV lines.
    i) Name the plastic used for high frequency applications.
    j) How tesla coil is different from transformer?  \hspace*{1cm} 2x10

\textbf{PART-A}

Q.2 a) Why is a Cockcroft-Walton circuit preferred for voltage multiplier circuits? Explain its working with a schematic diagram.  \hspace*{1cm} 10
    b) Describe with a neat sketch, the working of Van de Graaff generator. What are the factors that limit the maximum voltage obtained?  \hspace*{1cm} 10

Q.3 Give Marx circuit arrangement for a multistage impulse generator. How is the basic arrangement modified to accommodate the wave time control resistances?  \hspace*{1cm} 20

Q.4 a) What are mechanisms by which lightning strokes develop and induce overvoltages on overhead power lines?  \hspace*{1cm} 10
    b) What is a surge arrester? Explain its function as a shunt protective device.  \hspace*{1cm} 10

\textbf{PART-B}

Q.5 What is meant by insulation co-ordination? How are the protective devices chosen for optional insulation level in a power system?  \hspace*{1cm} 20

Q.6 a) Derive Townsend’s current growth equation and explain Townsend’s criterion for breakdown.  \hspace*{1cm} 10
    b) Write short notes on any two:
       i) Suspended particle mechanism.
       ii) Cavitation and bubble mechanism.
       iii) Stressed oil volume theory.  \hspace*{1cm} 5x2

Q.7 Explain principle of common live line maintenance along with tool used for live line maintenance.  \hspace*{1cm} 20
End Semester Examination, May 2014
B. Tech. – Sixth Semester
INDUSTRIAL MANAGEMENT (HM-501)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer / explain any ten:
   a) Importance of staffing in an organization.
   b) Key factors to consider for a suitable plant location.
   c) Define the terms: normal time and standard time.
   d) What is a flow process chart?
   e) Key participants in the IR process in an industry.
   f) What is TQM?
   g) Importance of quality circles.
   h) Spell out a few important measures for employee welfare.
   i) What is EOQ formula in inventory management?
   j) Objectives of method study.
   k) Objectives of plant layout.
   l) Major traits of an entrepreneur.  2x10

PART-A

Q.2 a) If you were to set up a business unit, what managerial aspects you would learn and put to use.  15
   b) Discuss role of marketing manager in a business organization.  5

Q.3 Define plant layout. What are the problems generally faced in deciding a suitable plant layout? Spell out the principal factors involved.  20

Q.4 Explain work measurement and its detailed procedures involved.  20

PART-B

Q.5 a) Define the scope and objectives of material management.  10
   b) What are the duties of a purchase manager?  5
   c) What are the duties of a store manager?  5

Q.6 a) What is the importance of industrial relations in an industry?  10
   b) What are the essential conditions for maintaining good industrial relations?  10

Q.7 Write short notes on:
   a) ABC and VED analysis of inventory control.  10
   b) Quality control.  5
   c) Types of internal inspection.  5
End Semester Examination, May 2014
B. Tech. – Sixth Semester
OPERATIONS RESEARCH (M-601)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Write difference between a feasible solution, a basic feasible solution and an optimal solution.
b) What type of questions are sought to be answered in analyzing a queuing system?
c) What is economic interpretation of dual variables?
d) Name and explain three steps used in solving assignment problems using Hungarian method.
e) Differentiate PERT from CPM.

PART-A

Q.2
a) What is degeneracy in simplex solution of linear programming problems? 4
b) Using Gauss-Jordan reduction process maximize \( Z = 2x_1 + 4x_2 + 3x_3 \) subject to following constraints:
\[
\begin{align*}
& x_1 + 3x_2 + 2x_3 \leq 30 \\
& x_1 + x_2 + x_3 \leq 24 \\
& 3x_1 + 5x_2 + 4x_3 \leq 60
\end{align*}
\]

Q.3
a) Production capacities of three factories I, II and III are 7, 9 and 18 units, respectively while warehouse holding capacities of A, B, C and D are 5, 8, 7 and 14 units, respectively. Unit Cost of transportation from each factory to each warehouse is as given in the matrix below. Minimize total transportation cost:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>19</td>
<td>30</td>
<td>50</td>
<td>10</td>
</tr>
<tr>
<td>II</td>
<td>70</td>
<td>30</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>III</td>
<td>40</td>
<td>8</td>
<td>70</td>
<td>20</td>
</tr>
</tbody>
</table>

b) A factory has four workers A, B, C and D and there are 4 jobs to be performed. Time estimates in minutes each worker would take each of 4 jobs is given in table below. Find optimal assignment of jobs to workers (one to each) using Hungarian assignment method:

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6</td>
<td>12</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>B</td>
<td>11</td>
<td>8</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>C</td>
<td>16</td>
<td>14</td>
<td>15</td>
<td>12</td>
</tr>
<tr>
<td>D</td>
<td>9</td>
<td>9</td>
<td>11</td>
<td>6</td>
</tr>
</tbody>
</table>
Q.4 Maximize \( Z = 6x_1 + 8x_2 \) subject to:
\[
\begin{align*}
5x_1 + 2x_2 & \leq 20 \\
x_1 + 2x_2 & \leq 10
\end{align*}
\]
a) Construct the dual problem for above written primal problem.
b) Solve both primal problem as well as dual problem graphically.
c) Solve both primal problem and dual problem by simplex methods.

**PART-B**

Q.5 a) Taj service station has a central store where mechanics arrive to take spare parts for the jobs they work upon. Mechanics wait in queue if necessary and are served on a first-come first-served basis. Arrival rate of mechanic averages 6/hours while store attendant can serve 8 mechanics per hours on an average. Assuming arrival of mechanics is as per Poisson distribution and servicing time of attendant is exponentially distributed, determine \( W_s \), \( W_q \) and \( L_q \) where symbols carry their usual meaning.

b) In a project following activities are to be performed. Their durations are indicated in table below:

<table>
<thead>
<tr>
<th>Activity</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration in days</td>
<td>9</td>
<td>7</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

i) Draw network.
ii) Find total project length.
iii) Mark critical path.
iv) Find total float, free float and independent float for each activity.

Q.6 a) Write advantages and disadvantages of simulation.
b) For a certain product, probability distribution of daily demand is as given below:

<table>
<thead>
<tr>
<th>Units Demanded</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.02</td>
<td>0.08</td>
<td>0.11</td>
<td>0.16</td>
<td>0.19</td>
<td>0.13</td>
<td>0.10</td>
<td>0.08</td>
<td>0.07</td>
<td>0.06</td>
</tr>
</tbody>
</table>

While probability distribution of lead time is as given below:

<table>
<thead>
<tr>
<th>Lead Time in days</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<td>0.30</td>
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</table>

If re-ordering level is 20 and re-ordering quantity is 40 what will be stock position at the end of 12\(^{th}\) day for simulation. Use following random numbers for demand 68, 13, 09, 20, 73, 07, 92, 99, 93, 18, 24 and 33 and random numbers for lead time. Use 47, 74, 04 as per requirement.

Q.7 a) What are decision trees? How and in what type of situations are they employed for decision making?
b) A flower-shop manager purchases flowers for his customers. Daily demand for roses is as given below:

<table>
<thead>
<tr>
<th>Dozens of flower</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
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<td>0.2</td>
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Flowers (roses) are purchased at Rs. 10/- per dozen and sells at Rs. 30/- per dozen. Unsold roses are donated to a local hospital. How many dozens of roses should the manager purchase in order to maximize profit?
End Semester Examination, May 2014
B. Tech. – Sixth Semester
INDUSTRIAL MANAGEMENT (M-603)

Time: 3 hrs

Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Define system in management.
b) Enlist two factors of motivation as per Hertzberg’s theory.
c) Discuss principles of a plant layout.
d) What is virtual and paramid organization?
e) What is fixed position layout?
f) What do you mean by work study?
g) Define standard time.
h) What is the importance of inventory management?
i) Define variables and attributes.
j) Prepare a specimen copy of comparative statement used by purchase department.

PART-A

Q.2  What are the functions of management? Discuss dography Mc-Gror’s theory ‘X’ and theory ‘Y’.

Q.3  a) Explain the term: “organization structure”.
b) Draw structure chart for “live and staff” organization. Enumerate it advantages and disadvantages.

Q.4  a) Discuss factors governing plant location of an industrial unit.
b) Compare rural vs urban plant site.

PART-B

Q.5  a) What do you understand by: i) Operation process chart and ii) Flow process chart?
b) Differentiate between charts and diagram used for a method study.

Q.6  What are the duties of a purchase manager? Explain different methods for purchasing material.

Q.7  a) Define inspection and its objectives.
b) Discuss objectives and principles of quality control.
End Semester Examination, May 2014
B. Tech. – Sixth Semester
HEAT TRANSFER (M-604)

Time: 3 hrs  Max Marks: 100
No. of pages: 3

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What are the different modes of heat transfer?
     b) Discuss thermal contact resistance.
     c) Define steady and unsteady state of heat conduction.
     d) Explain lumped parameter analysis.
     e) Explain hydrodynamic and thermal boundary layer with a neat sketch.
     f) Explain difference between blackbody and gray body.
     g) Define absorptivity, reflectivity and transmissivity.
     h) Define Prandtl number and explain how it relates hydrodynamic boundary layer and thermal boundary layer.
     i) Write down the equation of fouling factor.
     j) Explain logarithmic mean temperature difference.  

2x10

PART-A

Q.2  a) Derive an expression for unsteady state heat conduction equation in Cartesian co-ordinates with internal heat generation.  10
     b) Saturated steam at 110° C flows inside a copper pipe of thermal conductivity 430 W/m°C, degree having an internal diameter of 10 cm, and an external diameter of 12 cm. The surface resistance on the steam side is 12000 W/m²°C and that on the outside surface of pipe is 18 W/m²°C. Determine the heat loss from the pipe if it is located in space at 25° C. How this heat loss would be affected if the pipe is lagged/insulated with 5 cm thick insulation of thermal conductivity 0.22 W/m°C.  10

Q.3  a) Derive an expression for the heat transfer rate from a fin of rectangular cross-section of infinite length.
     \[ Q_{fin} = \sqrt{\frac{P \cdot h \cdot A_f}{K}} \cdot (t_0 - t_a) \]
     Where, K is the thermal conductivity of fin material, P is perimeter of the fin, A_f is the cross-sectional area of the fin, t_0 is the base temperature and t_a is the ambient temperature, h is the heat transfer coefficient.  10
     b) A steel rod (k=30 W/m°C degree) 1 cm in diameter and 5 cm long protrudes from a wall which is maintained at 100° C. The rod is insulated at its tip and is exposed to an environment with, h=50 W/m²°C degree and t_a=30° C. Calculate the i) fin efficiency; ii) temperature at the tip of the fin; iii) Rate of heat transfer.  10

Q.4  a) Explain the following terms and write down the physical significance:
     i) Biot number
     ii) Fourier number.  10
     b) A cylindrical stainless steel (k=25 W/mK) ingot, 10 cm in diameter and 25 cm long, passes through a heat treatment furnace which is 5 meter in length. The initial ingot temperature is 90° C, the furnace gas is at 1260° C and the combined radiative and convective surface coefficient is 100 W/m²-K. Determine the maximum speed with which the ingot moves through the furnace if it must attain 830° C temperature \[ \alpha = 0.45 \times 10^{-6} \text{ m}^2/\text{s}. \]  10

P. T. O.
PART-B

Q.5 a) Derive an energy equation for thermal boundary layer, when fluid of density $\rho$, viscosity $\mu$ passes over a flat plate. Thermal conductivity of fluid is $K$.

$$
\frac{\partial t}{\partial x} + u \frac{\partial t}{\partial y} = k \frac{\partial^2 t}{\partial x^2} + \frac{\mu}{\rho c} \left( \frac{\partial u}{\partial y} \right)
$$

b) A thin flat plate of length $L=1$m and breadth $b=0.45$m is exposed to a flow of air parallel to its surface. The velocity and temperature of the free stream flow of air are respectively, $U_w=2.5$ m/s and $T_w=25^\circ$ C. If the temperature at the surface of plate is $T_s=95^\circ$ C, estimate the heat loss from 50cm length of plate measured from the trailing edge.

Q.6 a) Using the definition of radiosity and irradiation prove that the radiant interchange between two gray bodies is given by relation:

$$
Q_{ww} = \frac{A_1A_2(T_s^4 - T_w^4)}{(1-e_1/e_1 + \frac{1}{F_{12}} + (1-e_2)/e_2 x A_1/A_2)
$$

The notations have their usual meanings.

b) Establish a relation for the shape factor of a cavity with respect to itself. The cavity is closed on its outer surface with a flat surface.

![diagram](image)

i) Conical cavity ii) Hemispherical cavity

Q.7 a) Derive the relationship between the effectiveness and number of transfer units for a counter flow.

b) A heat exchanger is to be designed to condense 8 kg/s of an organic liquid ($T_{in} = 80^\circ$C), $h_w = 600$ kJ/kg with cooling water available at $15^\circ$ C and at a flow rate of 60 kg/s. The overall heat transfer coefficient is 480 W/m$^2$-degree. Calculate:

i) No. of tubes required. The tubes are to be of 25 mm outer diameter, 2 mm thickness and 4.85 m length.

ii) No. of tubes passes. The velocity of cooling water is not be exceeded 2 m/s.
## Property Values of Dry Air at One Atm. Pressure

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<tr>
<th>Temperature ( ^\circ C )</th>
<th>Density ( \text{kg/m}^3 )</th>
<th>Coefficient of Viscosity ( \mu \times 10^6 )</th>
<th>Kinematic Viscosity ( \nu \times 10^6 )</th>
<th>Thermal Diffusivity ( \alpha \times 10^6 ) m²/s</th>
<th>Prandtl Number</th>
<th>Specific Heat ( c_p ) J/kgK</th>
<th>Thermal Conductivity ( \lambda ) W/mK</th>
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1 W/mK = 0.86 kcal/m²K°C, 1 J/kgK = 238.9 × 10⁻⁶ kcal/kg°C

1 N/m² = 0.102 kgf/m², \( \beta = \frac{1}{T} \), T in K
End Semester Examination, May 2014
B. Tech. – Sixth Semester
IC ENGINES AND GAS TURBINES (M-621)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain briefly:
   a) Difference between Otto and diesel cycles
   b) Wankel engines
   c) Distributor
   d) Firing order
   e) Detonation
   f) Viscosity index
   g) Need for a cooling system
   h) Morse test
   i) Optimum pressure ratio in gas turbines
   j) T.H.P.

PART-A

Q.2 a) In an engine working on ideal Otto cycle the temperatures at the beginning and end of compression are 50° C and 373° C. Find the compression ratio and air standard efficiency of the engine.
   b) For Otto, diesel and dual cycles compare the efficiencies for the following cases with explanation:
      i) Same compression ratio and heat addition.
      ii) Same compression ratio and heat rejection.

Q.3 a) Differentiate between D-MPFI and L-MPFI systems.
   b) With the help of a neat sketch, explain the working of battery ignition system.

Q.4 a) With the help of neat sketch explain the stages of combustion in C.I. engines.
   b) With the help of a neat sketch explain the different types of combustion chambers used in S.I. Engines.

PART-B

Q.5 a) With the help of a neat sketch, explain splash and pressure lubrication systems?
   b) Discuss the advantages and limitations of air cooling system.

Q.6 a) A single-cylinder engine running at 1800 rpm develops a torque of 8 Nm. The indicated power of the engine is 1.8 kW. Find the loss due to friction power as the percentage of brake power.
   b) During the trial of a single cylinder, four stroke oil engine, the following results were obtained:

   Cycle diameter=20 cm
   Stroke=40 cm
   Mean effective pressure=6 bar
   Torque=407 Nm
   Speed=250 rpm

P. T. O.
Oil consumption=4 kg/hr
Calorific value of fuel=43 MJ/kg
Cooling water flow rate=4.5 kg/min
Air used per kg of fuel=30 kg
Rise in cooling water temperature=45° C
Temperature of exhaust gases=420° C
Room temperature=20° C
Mean specific heat of exhaust gas=1 kJ/kgK
Specific heat of water=4.18 kJ/kgK
Find ip, bp, and draw up a heat balance sheet for the test in kJ/hr.

Q.7  a) Explain the different components of gas turbine plant.  
     b) Write short notes on:  
        i) Open gas turbine plant  
        ii) Application of a gas turbine
End Semester Examination, May 2014
B. Tech. – Sixth Semester
POWER PLANT ENGINEERING (M-622)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on/explain:
   a) Different types of power plants.
   b) Define reserve factor.
   c) Rankine cycle.
   d) Hydrological cycle.
   e) Classification of hydraulic turbines.
   f) Electrostatic precipitator.
   g) What is PFBC system?
   h) What is CANDU-type reactor?
   i) Function of moderator in a nuclear power plant.
   j) Define incremental rate theory.

   PART-A

Q.2 a) State the essential elements and components of a hydroelectric power plant. 12
b) Discuss the influence of factors on which site selection for a power plant depends. 8

Q.3 a) What is circulation? What is the difference between natural circulation and forced circulation?
   b) Explain in detail the ASH handling system in steam power plants. 10

Q.4 a) What is Stirling cycle? Explain ideal regenerative cycle.
   b) Draw a flow sheet of modern steam power plant and explain its working. 12

   PART-B

Q.5 a) What are various types of combined cycle plants? What are the inherent advantages of such a plant?
   b) A 150 MW power house is operating on combined cycle. Suction of air take place at 1 bar and 300K. The maximum temperature is limited to 800°C. The pressure ratio is 8. The gas turbine exhaust is further heated to 800°C before entering into the boiler furnace. The steam production is at 50 bar and 600°C. The exhaust temperature is 200°C. The condenser pressure is 0.05 bar. Consider isotropic efficiencies of rotating machine to be 100%. Find out thermal efficiency of power plant.
   Take $C_p = 1 \text{kJ/kgK}$, Ratio of specific heat = 1.4, Calorific value of fuel $= 4.2 \times 10^4 \text{kJ/kg}$. 12

Q.6 Explain in detail with a neat sketch, basic nuclear reactions principles of nuclear energy and working of a nuclear power plant. 20

Q.7 a) A power plant has the following annual factors: Load factor = 0.75, capacity factor = 0.60, use factor = 0.65. Max demand is 60 MW. Estimate:
   i) The annual energy production
   ii) The reserve capacity over and above the peak load and
   iii) The hours during which the plant is not in service per year. 12
b) Write in brief about performance and operating characteristics of power plants. 8
End Semester Examination, May 2014  
B. Tech. – Sixth Semester  
AUTOMOBILE ENGINEERING (M-624)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain briefly:  
a) Hatch back  
b) Limousine  
c) Disadvantages of cone clutch  
d) Pan hard rod  
e) Radius rod  
f) Centrifugal clutch  
g) King pin inclination  
h) Power assisted brakes  
i) Positive crank case ventilation system  
j) Pitching  

2x10

PART-A

Q.2  
a) With the help of a neat sketch, explain how power is transmitted from engine to wheel in a four wheel drive vehicle.  
b) Write short notes on:  
i) Safety features installed in latest vehicle.  
ii) Future vehicle technology.  

5x2

Q.3  
a) Discuss in detail the construction and working of single plate helical coil spring clutch with the help of a neat sketch. What are its merits and demerits?  
b) Write short notes on:  
i) Electromagnetic clutch  
ii) Multiplate clutch  

5x2

Q.4  
a) Sketch general arrangement of live rear axle. Identify various loads that it has to withstand and explain them.  
b) Write short notes on:  
i) Overdrive  
ii) Trans axle  
iii) Zrpepa joint  

PART-B

Q.5  
a) State the different factors of wheel alignment.  
b) Derive the basic conditions for the steering mechanism for perfect rolling of all wheels.  

10

Q.6  
a) What are the different factors affecting the tyre life? Explain them.  
b) With the help of a neat sketch, explain the braking system used in Maruti Alto car.  

10

Q.7 Write short notes on:  
a) Exhaust gas recirculation system  
b) Battery maintenance  
c) Catalytic converter  
d) Vehicle lighting system  

5x4
End Semester Examination, May 2014
B. Tech. – Sixth / Seventh Semester
ELECTRONIC SYSTEM DESIGN (EC-722)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Represent a decimal number [367]10 in
   i) BCD code   ii) Octal form   iii) Excess 3 code   iv) Hex code
b) Design a circuit diagram of XOR gate using CMOS logic.
c) Differentiate between PLA and PAL.
d) Implement 4:1 multiplexers using 2:1 multiplexers.
e) Differentiate between ring and Johnson's counter.
f) Subtract 37 from 11 using 2's complement arithmetic.
g) Explained the wired logic.
h) Solve the following equation using Boolean algebra.
   \[ \overline{A}BC + \overline{A}BC + \overline{A}BC + ABC = BC + \overline{C} + AB \]
i) Convert the gray code (101110111) to binary code.
j) Implement the given function using NAND gate
   \[ f = x_1x_2 \overline{x}_3 + x_1x_2x_3 + \overline{x}_1x_2x_3 \]
   \[ 2 \times 10 \]

PART-A

Q.2 a) Explain the design of digital hardware unit.
   b) Design the simplest circuit that has 3 inputs \( x, y \) and \( z \), which produces an output value of one whenever 2 or more of input variables have the value one, otherwise the output has to be zero.
   c) Find the minimum cost SOP and POS forms for the function
   \[ f(x_1, x_2, x_3) = \overline{a}M(1, 4, 7) + a(2, 5) \]
   \[ 4 \]

Q.3 a) Find the minimum cost circuit for function
   \[ f(x_1, x_2, x_3, x_4) = \sum m(0, 4, 8, 13, 14, 15) \]
   Assume that I/P variables are available in uncomplemented form only using functional decomposition.
   b) Consider the function
   \[ f[A, B, C] = \sum m(2, 3, 4, 6, 7) \]
   Show how it can be realized using 2 input LUTs. (Don't show wires)
   \[ 10 \]

Q.4 a) Prove the Shannon's expansion theorem for multiplexer.
   b) Implement three input XOR gate using 2:1 MUX.
   c) Design a 3 to 8 decoder using two to 4 decoder.
   \[ 10 \]

PART-B

Q.5 a) Design a BCD up counter.
   b) Show how an SR flip-flop can be constructed using D flip-flop.
   \[ 12 \]

Q.6 a) Design Moore type FSM for serial adder.
   b) Explain one hot encoding and design the circuit for given example in which \( a \) is input and \( x \) is output.
   \[ \begin{array}{cccccccccc}
   \text{clk} & \text{t}_0 & \text{t}_1 & \text{t}_2 & \text{t}_3 & \text{t}_4 & \text{t}_5 & \text{t}_6 & \text{t}_7 & \text{t}_{10} \\
   a & 0 & 1 & 0 & 1 & 1 & 0 & 1 & 1 & 1 \\
   x & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 1 & 0 \\
   \end{array} \]
   \[ 10 \]

Q.7 Write short notes on any two:
   a) Dynamic and static hazards
   b) State minimization technique
   c) Cycles and races
   \[ 10 \times 2 \]
End Semester Examination, May 2014
B. Tech. – Sixth / Seventh Semester
E-COMMERCE AND ERP (IT-722)

Time: 3 hrs  
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Differentiate between a smart card and a debit card.
   b) List advantages of ERP.
   c) Define e-cash and e-payment.
   d) What do you mean by digital wallets?
   e) Compare e-marketing and Tele-marketing.
   f) What do you mean by digital currency?
   g) List advantages of e-commerce.
   h) List risk of e-commerce.
   i) Differentiate between digital signature and digital certificate.
   j) What do you mean by home-shopping?  2x10

PART-A

Q.2 a) Explain four C's of e-commerce.

Q.3 a) What is digital payment system and explain cyber cash model?
   b) Explain different techniques used in electronic payment system.  10

Q.4 Write short notes on:
   a) EDI.
   b) Firewall.
   c) Cryptography.
   d) Operational process of digicash.  5x4

PART-B

Q.5 a) Explain briefly different modules of ERP.
   b) List various advantages and disadvantages of ERP.  10
   c) Explain origin of the term SCM.  5

Q.6 a) Compare production planning, production scheduling and production control.
   b) Explain various functions and applications of resource management.  10

Q.7 Write short notes on:
   a) Product life cycle management.
   b) Information system planning.
   c) Critical success factors of ERP implementation.
   d) HRD Module.  5x4
End Semester Examination, May 2014
B. Tech. – Sixth / Seventh / Eighth Semester
ARTIFICIAL INTELLIGENCE (CS-801)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Define an agent.
b) What are various applications of AI?
c) Give the limitations of monotonic system.
d) Differentiate between forward and backward reasoning.
e) What is a frame?
f) Name the basic components of a script.
g) Write the algorithm for generate and test techniques.
h) Name the types of agents.
i) What are horn clauses?
j) Name the different applications of robotics.

PART-A

Q.2 a) Write LISP program for Fibonacci series.
b) Explain the history of AI in detail.

Q.3 a) Explain A* algorithm with a suitable example.
b) Give the basic requirements of state space search.
c) Discuss the various problem characteristics.

Q.4 a) Draw the partitioned semantic Net for the following:
i) Every dog in town has bitten the constable.
ii) All the batters like the pitcher.
b) Convert to clause form and solve using resolution: Was Marcus loyal to Caesar?
i) Marcus was a man.
ii) Marcus was a Pompeian.
iii) All Pompeians were Romans.
iv) Caesar was a ruler.
v) All Romans were either loyal to Caesar or hated him.
vi) Everyone is loyal to someone.
vii) People only try to assassinate rulers they are not loyal to.
viii) Marcus tried to assassinate Caesar.

PART-B

Q.5 a) Write short notes on:
i) Fuzzy based reasoning system.
ii) Probability based reasoning.
iii) Default reasoning.
b) Explain Baye's theorem in detail.

Q.6 a) Explain rule-based system architecture in detail.
b) Explain the simple reflex agent with a diagram.

Q.7 a) Discuss alpha-beta pruning algorithm with an example.
b) Explain various natural language analysis techniques in detail.
End Semester Examination, May 2014
B. Tech. — Sixth / Seventh/Eighth Semester
ADVANCED JAVA PROGRAMMING (IT-801)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain following in detail:
a) Java Beans components.
b) Byte code verification.
c) Drag and Drop facilities.
d) Styled text component.
e) Database URL.
f) LDAP protocol.
g) Security manager and permission.
h) Trees.
i) Stroke.
j) Server socket class.

PART-A

Q.2 a) Explain JDBC layered architecture in detail. What is the role of JDBC drivers? Explain steps of Java communication in detail. 10
b) Write a program to select student ID, name and age from student database where student name starts with letter 'A'.

Q.3 With reference to sockets, explain how client/server communication is accomplished in Java? Write a program to print the protocol, host and file components of a URL. 20

Q.4 a) Write a program to create a list and perform the following operations:
   i) Add an item.
   ii) Remove an item.
b) Write down the constructor of the following:
   i) Progress indicator.
   ii) Table.

PART-B

Q.5 What is bean writing process? Explain in detail with an example. What are various naming patterns for bean properties and events? Write down different types of bean properties.

Q.6 a) What are class loaders? Explain encryption techniques and digital signature. 10
b) What do you mean by authentication? Describe java authentication and authorization in detail.

Q.7 a) Write a program to implement the clipping on a given image. 10
b) Explain transparency, composition and clipboard.
End Semester Examination, May 2014
B. Tech. – Sixth / Seventh / Eighth Semester
NETWORK PROGRAMMING AND ADMINISTRATION (IT-701)

Time: 3 hrs Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Give the syntax and function of Tracert and Netstat commands.
   b) What is the difference between ARP and RARP protocols?
   c) What are socket options? Name any two of them.
   d) What is the function of TCP echo service?
   e) What are the functions of a concurrent server?
   f) How mutual exclusion is handled by RPC?
   g) What is authentication in networks? Give an example.
   h) What is difference between static and dynamic routing?
   i) What is RADIUS? Give its application.
   j) What is a proxy server? Give an example. 2x10

PART-A

Q.2 a) What is classless addressing? What are the restrictions on it? If one of the addresses of a block is 205.16.37.39/28, find:
   i) First address of block.
   ii) Last address of block.
   iii) Total number of addresses in a block. 10
   b) ICMP lies on which layer of TCP/IP protocol suite. What is its main function? Explain all the types of message in detail. 10

Q.3 a) Define socket. Give elementary TCP client-server socket communication in detail. Also explain primary socket function calls. 10
   b) What is a DNS application and DNS resolver? Give syntax, meaning and return value of following functions:
      i) getHostByName()
      ii) getHostByAddr()
      iii) getProtoByName() 10

Q.4 a) What are the problems faced by a simple server? How servers are classified? Write the algorithm for iterative connection-oriented and connection-less servers. 10
   b) Write short notes on:
      i) NFS.
      ii) ARP. 10

PART-B

Q.5 a) What is RPC? Why RPC is needed in networking? Discuss its model with respect to client and server. 10
   b) Write short notes on:
      i) RPC retransmits.
      ii) Dynamic port mapping. 5x2

Q.6 a) What is PPP? What are its functions? Discuss its components in detail. 10
   b) How does a web server support global data transfer? What are the steps to configure web server? Explain. 10

Q.7 a) What are the C1, C2, C3, and C4 categories of security? How do they perform in providing network security? 10
   b) What is a TCP wrapper? How does it differ from firewalls? Give its initial and advanced configuration. 10
End Semester Examination, May 2014
B. Tech. – Sixth / Seventh / Eighth Semester
EMBEDDED SYSTEM DESIGN (EC-822)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Differentiate between a microcontroller and a microprocessor.
b) What is an interrupt? How is it executed?
c) What is the difference between ACALL and LCALL?
d) Write instructions to select register bank 2 in 8051 microcontroller.
e) Show the status of CY, AC and P flag after addition of 3FH and 2FH.
f) Write the instruction to select timer 2 in mode 2 in 8051 microcontroller.
g) Write down all interrupts of 8051 microcontroller in the descending priority order.
h) What do you mean by watch dog timer reset?
i) What is the function of INDF in PIC microcontroller?
j) What is the function of GIE and PEIE in INTC register?

PART-A

Q.2 a) Explain the addressing modes of 8051 microcontroller with an example.
b) Explain the following instructions:
   i) JBC PSW.7, target
   ii) MOVX A, @DPTR
   iii) RETI
   iv) SWAP A
   c) Draw and explain architecture of an 8051 microcontroller. Also specify the function of following pins.
      i) ALE
      ii) PSEN

Q.3 a) Discuss various timer modes supported by an 8051 microcontroller. What is special about auto-reload mode?
b) Write a program to generate square-wave of 10 kHz in mode-2. Assume XTAI=11.0592 MHz.
c) Explain contents of IE and IP registers.

Q.4 a) What do you mean by microcontroller's memory types?
b) Write short note on CISC vs RISC.
c) Explain the following:
   i) Clocking.
   ii) Peripheral devices.

PART-B

Q.5 a) Draw and explain the architecture and pipelining of a PIC microcontroller. Explain every block in detail.
b) Explain following instructions in PIC:
   i) bcf f,b
   ii) movwf f
   iii) incfsz f,w
   iv) clrw
   v) bsf f,b
   vi) comp f,F
   c) Write a program in PIC to add two 8-bit numbers.

Q.6 a) Discuss input port expansion in detail.
b) Explain timer 2 scaler initialization in PIC.
c) Explain interrupt logic in PIC.

Q.7 a) Write a program to display "MRUI" on LCD display.
b) Explain interfacing of ADC with an 8051 microcontroller.
End Semester Examination, May 2014
B. Tech. – Sixth Semester
NEW AND RENEWABLE ENERGY SOURCES (EE-625)

Time: 3 hrs

Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all. Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Explain greenhouse effect.
     b) Discuss in brief the characteristics of wind.
     c) What do you mean by global warming?
     d) Discuss the various types of heat exchangers.
     e) Define hydrogen energy.
     f) What are the different types of hydraulic turbines?
     g) Discuss the considerations for selection of site for wind energy conversion systems.
     h) Define energy farming.
     i) Give the names of various instruments used for measuring solar radiation.
     j) Discuss the disadvantages of OTech plants.

PART-A

Q.2  a) Discuss the performance analysis of flat-plate collectors in detail.
     b) What do you mean by conventional sources of energy production? Discuss the various sources in brief.

Q.3  a) Discuss the construction and characteristics of silicon PV cells.
     b) Discuss the following:
        i) Photovoltaic effect
        ii) Materials used for the construction of solar cells.

Q.4  a) Discuss horizontal axis and vertical axis wind turbines in detail.
     b) Explain lift force and drag force in detail.

PART-B

Q.5  a) Derive the relation for yearly power generation from a tidal project.
     b) Discuss closed cycle and open cycle OTech plants in detail.

Q.6  a) Define anaerobic digestion system of biogas technology in detail and what are its advantages.
     b) Give the detail classification of small hydro power stations.

Q.7  a) Define nuclear fusion in detail and then compare it with nuclear fission.
     b) Name the various components of fuel cell and then explain its working.
End Semester Examination, May 2014  
B. Tech. – Sixth Semester  
DESIGN OF ELECTRICAL MACHINES (EE-604)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.  

Q.1  
a) What are main dimensions of a rating machine?  
b) What are factors that modify the reluctance of air gap?  
c) What is real and apparent flux density?  
d) Why large size machines have large rating line constant?  
e) State the relationship between number of armature coils and number of commutator segments in DC machines.  
f) What is chording?  
g) Which part of induction motor has maximum flux density? What is the value of maximum flux density in that part?  
h) What is the limiting factor for diameter of synchronous machines?  
i) State the merits of computer aided design of electrical machines.  
j) How is cylindrical pole different from salient pole in a synchronous machine? 2x10  

PART-A  

Q.2  
a) Estimate the main dimension including winding conductor area of a 3-phase delta-star core type transformer rated at 300 kVA, 6600/400 V, 50 Hz. A suitable core with 3 steps having a circumscribing circle of \( \cdot 2.5 \) m diameter and leg spacing of \( \cdot 4 \) m is available. Emfl turn=8.5 V, \( \sigma =2.5 \) A/mm\(^2\), \( K_w=0.28 \) and \( S_e=0.9 \).  
\[ \text{10} \]  
b) Derive voltage per turn equation of a single phase transformer.  
\[ \text{10} \]  

Q.3  
a) Derive the expression for temperature rise- time curve for an electrical machine.  
\[ \text{12} \]  
b) Write a note on classification of insulating materials.  
\[ \text{8} \]  

Q.4  
a) Derive the relationship between real and apparent flux densities.  
\[ \text{10} \]  
b) Explain the choice of specific magnetic and electric loading of synchronous machines.  
\[ \text{10} \]  

PART-B  

Q.5  
a) List out the procedure involved in design of shunt field winding and series field winding.  
\[ \text{10} \]  
b) Derive the output equation of DC machine.  
\[ \text{10} \]  

Q.6  
a) Explain various methods of cooling used for alternators.  
\[ \text{10} \]  
b) Discuss the choice of number of slots and slot design in synchronous machines.  
\[ \text{10} \]  

Q.7  
a) Explain the dispersion coefficient and how does it affect the performance of induction motor.  
\[ \text{10} \]  
b) What are the limitations of design of electrical apparatus? Explain them.  
\[ \text{10} \]
End Semester Examination, May 2014
B. Tech. – Sixth / Seventh/Eighth Semester
VLSI DESIGN (EC-724)

Time: 3 hrs
Max Marks: 100

No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) What is Moore’s Law?
b) What is channel length modulation?
c) What is scaling? Write its effects.
d) Differentiate between static and dynamic power dissipations.
e) What is the condition for weak and strong inversion in NMOS?
f) Implement 2:1 MUX using transmission gate.
g) Discuss constant source and limited source diffusion.
h) Implement inverter using CMOS.
i) What is a stick diagram?
j) Differentiate PAL and PLA.

2x10

PART-A

Q.2
a) Describe various steps followed for the designing of an integrated circuit.
10
b) Discuss trends followed for the development of IC technology.
10

Q.3
a) Explain ion-implantation system in detail.
5
b) Write steps followed for photo lithography process.
5
c) Explain fabrication process of CMOS inverter (using twin-tub process).
10

Q.4
a) Explain V-I characteristics of MOSFET. Also derive current equation for linear and saturation region of operation.
10
b) Draw and label the energy trend diagrams of metal oxide and semiconductor layers in a MOS system as three separate components.
10

PART-B

Q.5
a) Derive pull-up to pull down ratio of an NMOS inverter driven by another inverter through a number of pass transistor.
10
b) Discuss five regions of operation of CMOS inverter.
10

Q.6
a) Implement the following Boolean function using CMOS logic $Y = A + BC$.
6
b) Draw the stick diagram of XOR gate.
6
c) Implement D flip-flop circuit using CMOS technology.
8

Q.7
Write short notes on any two:
a) ROM and RAM.
b) FPGA.
c) Punch through effect, impact ionization and mobility variation.
10x2
End Semester Examination, May 2014
B. Tech. – Fourth / Fifth Semester
POWER ELECTRONICS (EE-502)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Draw v-i characteristic of an S.C.R.
     b) Define latching current.
     c) What is function of freewheeling diodes?
     d) What is snubber circuit?
     e) What are circulating currents?
     f) Draw the circuit of a type D chopper.
     g) What is time ratio control (TRC) in choppers?
     h) What is meant by phase control?
     i) What is the basic principle of an inverter?
     j) Draw the symbols for i) DIAC ii) TRIAC.  

PART-A

Q.2  a) What are various methods to turn on S.C.R.?  
     b) What are various types of commutation? Explain any one type of forced
        commutation in detail with waveforms. 

Q.3  a) Explain the construction details and working of MOSFET.
     b) Explain the types of power diodes. 

Q.4  a) Describe the working of single phase full-wave converter feeding with RLE load.
     b) Explain the working of a dual converter. What are the causes of circulating
        currents?  

PART-B

Q.5  a) Discuss the principle of working of 3-phase bridge inverter with 120 mode of
     operation.
     b) What is difference between voltage source inverter and current source inverter? 

Q.6  a) Explain the working of a single phase to single phase step-up cycloconverter with
     circuit diagram and waveforms.
     b) Explain with waveforms working of AC voltage regulator with R load. 

Q.7  a) Describe the principle of step-up chopper. Derive an expression for average output
     voltage.
     b) Explain in detail working of a four-quadrant chopper (type E).
End Semester Examination, May 2014
B. Tech. – Sixth Semester
REFRIGERATION AND AIR CONDITIONING (M-811)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q. 1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q. 1  
a) Define one tonne of refrigeration. Explain the temperature limitations of a reversed Carnot cycle.  4
b) Draw flow diagram, T-S and P-H diagram of simple vapour compression cycle.  4
c) Draw the labeled diagram of simple vapour absorption cycle. Show flow of refrigerant by arrows.  3
d) Show heating and humidification process and cooling and dehumidification process on psychometric chart.  3
e) i) Name five expansion devices.
   ii) Name five evaporator types.  3
f) Define following:
   i) Room sensible heat factor.
   ii) Grand sensible heat factor.  3

PART-A

Q. 2  
a) A refrigerator using Carnot cycle requires 1.25 KW/TR to maintain a temperature of -30°C. Find:
   i) C.O.P. of refrigerator  ii) Temperature at which heat is rejected
   iii) Heat rejected per tonne of refrigeration  8
b) Explain all processes in a reversed Brayton (or Bell-Coleman) cycle with a neat sketch. Draw the P-V and T-S diagrams and calculate C.O.P. also.  12

Q. 3  
a) Aircraft is flying at an altitude of 8000 m at a speed of 900 km/hr. The pressure and temperature of air at this altitude are 0.34 bar and 263 K, respectively. The air is compressed by an air compressor with a compression ratio of 5. The cabin pressure is 1.013 bar and temperature is 300 K. Determine the power required for pressurization excluding ram work. Extra power required for refrigeration purpose and refrigeration capacity of the system if the air flow rate is 1 kg/s. Take the following data:
   \[ \eta_e = 82\% \quad \eta_r = 77\% \quad \varepsilon (\text{effectiveness of H.E.}) = 0.8 \quad \eta_{r,\text{ram efficiency}} = 84\% \]  10
b) With the help of a neat sketch, explain vapour compression refrigeration system.  10

Q. 4  
a) With the help of neat sketch, explain the working of ammonia water vapour absorption refrigeration system.  10
b) Write the various applications of cryogenics.  5
c) Draw a neat sketch of cascade vapour compression refrigeration system.  5

PART-B

Q. 5  
a) The moist air at 10°C and 50% relative humidity enters a steam heating coil at the rate of 50 kg/s and the temperature at exit is noted to be 30°C. Determine:

P. T. O.
i) Sensible heat transfer.
ii) Mass flow rate of steam if it enters saturated at 100° C and the condensate leaves at 65° C.

b) 120 m³/min of air at 35° C dry bulb temperatures and 45% relative humidity is mixed with 325 m³/min of recirculated air at 20° C dry bulb temperatures and 10° C dew point temperatures. Determine the enthalpy; specify volume, humidity ratio and dew point temperature of the mixed steam.

Q.6 The following data relate to the office air conditioning plant having maximum seating capacity of 25 occupants:

Outside design conditions : 34° C DBT, 28° C WBT
Inside design conditions : 24° C DBT, 50% RH
Solar heat gain : 9120 W
Latent heat gain per occupant : 105 W
Sensible heat gain per occupant : 90 W
Lightening load : 2300 W
Sensible heat load from other sources : 11630 W
Infiltration load : 14 m³/min.

Assuming 40% fresh air and 60% of recirculated air passing through the evaporator coil and the by-pass factor of 0.15, find the dew point temperature of the coil and capacity of the plant.

Q.7 a) Explain difference between air cooled and water cooled condenser.
b) Explain following types of evaporators with neat sketches:
   i) Shell and tube evaporator
   ii) Natural convection evaporator
End Semester Examination, May 2014
B. Tech. – Sixth Semester
NUMERICAL METHOD AND OPTIMIZATION TECHNIQUES (MA-501)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Prove that \( e^{\ln^3} = \Delta \).
b) If \( g(x) \) is continuous in \([a, b]\), then under what condition the iterative method \( x = g(x) \) has a unique solution in \([a, b]\)?
c) Compare Gauss Jacobi and Gauss Seidal methods for solving linear system of the form \( AX = B \).
d) Find dominant eigenvalue of \( \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \) by power method.
e) Show that N-R formula to find \( \sqrt{a} \) can be expressed in the form:
\[ x_{n+1} = \frac{1}{2} \left( x_n + \frac{a}{x_n} \right) \text{; where } n = 0, 1, 2, 3... \]
f) Define dual simplex Method.
g) Construct a linear interpolating polynomial given the points \((x_0, y_0)\) and \((x_1, y_1)\).
h) Write a formula to find the maxima of any function \( y = f(x) \).
i) Define Boole’s rule of integration.
j) In solving \( \frac{dy}{dx} = f(x, y) \), \( y(x_0) = y_0 \); write down the Taylor’s series for \( y(x_1) \).

2x10

PART-A

Q.2
a) Fit a curve \( y = ae^{mx} \) to the following data:
\[
\begin{array}{c|c|c|c}
  x & 0 & 2 & 4 \\
  y & 5.1 & 10 & 31.1 \\
\end{array}
\]

b) Given \( \log_{10} 654 = 2.8156, \log_{10} 658 = 2.8182, \log_{10} 659 = 2.8189, \log_{10} 661 = 2.8202 \).
Find by using Newton’s divided difference the value of \( \log_{10} 656 \). 10

Q.3
a) Find the root of the equation:
\[ xe^x = \cos x \]
Use secant method correct to 4 decimal places. 10
b) Find the root of the equation \( x^3 - 2x - 5 = 0 \) correct to 3 decimal places using Regula-Falsi Method. 10

Q.4
a) Solve by Gauss–Jacobi iteration:
\[ 8x - 3y + 2z = 20; 6x + 3y + 12z = 35; 4x + 11y - z = 33 \]
b) Using power method, find largest eigenvalues and the corresponding eigenvector for:
\[
A = \begin{pmatrix}
1 & 3 & -1 \\
3 & 2 & 4 \\
-1 & 4 & 10
\end{pmatrix}
\]

10

P. T.O.
PART-B

Q.5  a) Given the following data, find the maximum value of $y$:

<table>
<thead>
<tr>
<th>x</th>
<th>-1</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>-21</td>
<td>15</td>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

\[ \int_0^1 \frac{dx}{2\sin^2 x + \left(\frac{1}{4}\right)\cos^5 x} \]

b) Compute the integral using Simpson’s 3/8th rule.

Q.6  a) Compute $y(0.2)$ correct to 4 decimal places from the Taylor’s series solution of the equation $y'' = y^2 - 2x, y(0) = 1$.

b) Consider the initial value problem.

\[ \frac{dy}{dx} = y - x^2 + 1, \quad y(0) = 0.5, \quad \text{find } y(0.4) \text{ by 4th order R-K Method by taking } h = 0.2. \]

Q.7  a) Use graphical method to solve:

Maximize: $z = 3x_1 + 2x_2$

Subjected to:

\[ x_1 - x_2 \geq 1 \]
\[ x_1 + x_2 \geq 3 \]
\[ \text{and } x_1, x_2 \geq 0 \]

b) Solve the following LPP:

Maximize: $z = 2x + 3y$

Subjected to:

\[ -2x + 3y \leq 2 \]
\[ 3x + 2y \leq 5 \]
\[ \text{and } x, y \geq 0 \]
End Semester Examination, May 2014
B. Tech. – Sixth Semester
ENERGY CONSERVATION AND MANAGEMENT (EE-626)

Time: 3 hrs
Max Marks: 100
No. of pages: 2
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Write down the objectives of supply side management.
   b) Explain the following instruments.
      i) Pyrite
      ii) Fuel efficiency monitor
   c) What do you mean by thermal equilibrium?
   d) What do you mean by entropy?
   e) Explain the following terms.
      i) Maximum demand
      ii) Diversity factor
   f) Explain the following instruments:
      i) Water flowmeter
      ii) Infrared thermometer
   g) Explain the coefficient of performance.
   h) Draw the organization chart for non-energy intensive organization.
   i) What do you mean by compensator in heating?
   j) Write down the advantages of cogeneration plants.

   \[2 \times 10\]

PART-A

   b) Draw and explain the organization chart for both non energy and energy intensive organization.

   \[14\]

Q.3 a) Discuss the pre audit phase of energy audit in detail.
   b) During energy audit the data collection is as under:
      i) Power consumption of geysers for bathing = 7 kW
      ii) Power consumption of geysers for washing = 8 kW
      iii) Power consumption of boiler for pantry = 10 kW
      Average running hours of boilers and geysers = 10 hrs a day
      Number of months for which the above consumption is 6 months. It is proposed by the energy auditors to replace the above with solar water heaters. 50 litres of solar water heater can save 1000 KWH of electricity per year.
      a) Estimate no: of 50 litres solar water systems to replace geysers and boilers.
      b) Evaluate monetary savings and payback period. Assume cost of each solar water heater Rs 15000 and cost of electricity is 7 kWh.

   \[12\]

Q.4 a) Discuss refrigeration in detail along with its block diagram.
   b) Discuss all laws of thermodynamics.

   \[10\]

PART-B

Q.5 a) Define:
      i) Base load
      ii) Peak load
   b) A generating station has the following daily load cycle:

   \[
   \begin{array}{|c|c|c|c|c|c|c|c|c|}
   \hline
   \text{Time (hrs)} & 0 - 6 & 6 - 10 & 10 - 12 & 12 - 16 & 16 - 20 & 20 - 24 \\
   \hline
   \text{Load (MW)} & 70 & 80 & 90 & 80 & 80 & 70 \\
   \hline
   \end{array}
   \]

   \[6\]

P. T. O.
Draw the load curve and load duration curve and find:
   i) Maximum demand.
   ii) Units generated per day.
   iii) Average load.
   iv) Load factor.

Q.6 a) What do you mean by life cycle costing? Discuss the various factors to be considered for life cycle costing.
    b) What are the considerations taken for using payback period?

Q.7 a) Write a short note on cogeneration technologies.
    b) Discuss the use of computers in energy management.
End Semester Examination, May 2014
B. Tech. – 6th / 7th Semester (ECE) / 8th Semester (EEE)
MICROCONTROLLERS AND APPLICATIONS (EC-702)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer any ten:
   a) What are the sizes of on chip RAM and ROM in 8051?
   b) Describe the function of PSEN and EA signals of 8051.
   c) Write a code to send F5H to port P1 and P2 of 8051 using their addresses.
   d) What and where will be the final result after execution of following set of instructions?
      \[
      \begin{align*}
      &\text{MOV R4} \neq 25H \\
      &\text{MOV A} = 1FH \\
      &\text{ADD A, R4}
      \end{align*}
      \]
   e) What is the function of DPTR in 8051?
   f) What is the difference between instructions LJMP and SJMP in 8051?
   g) What is the function of TMOD register?
   h) What is the difference in the timer lengths in mode 0, 1 and 2?
   i) What is meant by the term interrupt vector?
   j) What instructions are used to enable and disable all interrupts of 8051?
   k) What are the control pins of LCD?
   l) What is the function of EOC pulse?

   \[2\times10\]

PART-A

Q.2 a) What is the difference between a microprocessor and a microcontroller? 6
   b) Draw the internal block diagram of 8051 and describe its features. 10
   c) What function do signal ALE and RESET perform in 8051? What are the contents of PC and SP upon RESET signal of 8051? 4

Q.3 a) What bit addresses are assigned to the following in 8051?
    PCON, TCON, P3, PSW and Register A 5
   b) What does each of the following instructions do in 8051?
      \[
      \begin{align*}
      &\text{SETB 84H} \\
      &\text{CLR 95H} \\
      &\text{JB \text{PSW.2, HERE}} \\
      &\text{MOV C, ACC.0} \\
      &\text{MOV A, @R1}
      \end{align*}
      \]
   c) Explain immediate and indirect addressing modes of 8051 with an example. 2x5

Q.4 a) Describe various basic registers of timers in 8051. 4
   b) Explain characteristics and operation of mode 1 of timer in 8051. Write down the steps to program the in mode 1. How does mode 0 differ from mode 1? 12
   c) In what way is mode 2 programming different from mode 0 and mode 1? 4

PART-B

Q.5 a) Illustrate the format of serial port control register of 8051 and describe the function of its each bit. 8

P. T. O.
b) Explain steps to program 8051 to transfer character bytes serially.  
6

c) Write a program to receive the data which has been sent in serial form and send the same out to port 0 in parallel form.  
6

Q.6  
a) List down and explain the interrupts of 8051.  
6

b) Describe the format of IE register of 8051. Write the instruction to enable the serial interrupt, Timer 0 interrupt and EX1.  
8

c) What are advantages of interrupt-based data transfer?  
6

Q.7  
a) How external ROM can be interfaced with 8051? Explain.  
7

b) How the data and commands can be sent to LCD from 8051 using MOVC instructions? Explain with an example.  
8

c) Write down steps to get data from ADC when interfaced with 8051.  
5
End Semester Examination, May 2014  
B. Tech. – Sixth Semester  
CONTROL SYSTEM ENGINEERING (EE-501A)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2  
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Define transfer function.  
b) Explain Mason's rule.  
c) Define settling time of second order system.  
d) List the factors on which the steady state error of a control system depends.  
e) Applying Routh criterion to investigate the stability of a system with characteristic equation.  
   \[ s^4 + 2s^3 + 3s^2 + s + 1 = 0 \]  
f) What is meant by frequency response analysis?  
g) Define minimum phase system.  
h) What is meant by compensation in relation to a control system?  
i) What is the essence of derivative feedback control?  
j) What are the main applications of servomotor?  

2x10

Q.2  
a) Determine the transfer function \( C(s)/R(s) \) from the block diagram:

\[ \begin{array}{c}
R(s) \\
\downarrow G_1 \\
\downarrow \times \times \\
\downarrow G_3 \\
\downarrow \times \times \\
\downarrow G_2 \\
\downarrow \times \times \\
\downarrow \text{H}_2 \\
\downarrow \text{H}_1 \\
\downarrow G_3 \\
\downarrow C(s) \\
\end{array} \]

b) Find the transfer function of an armature controlled d.c. motor.  

Q.3  
a) Discuss the time response of underdamped second order system with unit step input.  
b) The open loop transfer function of a unity feedback system is given by:

\[ G(s) = \frac{108}{s^2(s+4)(s^2+3s+12)} \]  
Find static error coefficient and steady state error of a system when subjected to input \( r(t) = 2 + 5t + 2t^2 \).  

Q.4  
Sketch the root locus as \( k \) varies from zero to infinity whose open loop transfer function is given as:

\[ G(s)H(s) = \frac{k}{s(s+2)(s^2+6s+25)} \]  

20

P. T. O.
PART-B

Q.5  
   a) State and explain Nyquist stability criterion. 
   b) Sketch the polar plot of transfer function of a unity feedback control system. 
      \[ G(s) = \frac{10}{s(s + 1)(s + 2)} \] 
   10

Q.6  
   a) Explain principle and working of synchros. 
   b) Describe the construction and working of any one type of stepper motor. 
   10

Q.7  
   Write short notes on: 
      a) Proportional, integral and derivative controllers. 
      b) Phase lag and phase lead compensation. 
   10
End Semester Examination, May 2014  
B. Tech. – Seventh Semester  
MICROWAVE ENGINEERING (EC-701)

Time: 3 hrs  
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Briefly explain the terms: guide wavelength and group velocity.  
b) Is TM_{10} mode of transmission supported by a rectangular waveguide?  
c) What is the relationship between a loaded cavity resonator with an unloaded cavity resonator for quality factor?  
d) If the peak transmitted power in a radar system is increased by a factor of 81, then by what factor maximum range of radar will be increased.  

\[ 5 \times 4 \]

\[ \text{PART-A} \]

Q.2  
a) With a diagram briefly explain the functioning of:  
i) Rat race coupler  
ii) E-plane tee  
b) What is cavity excitation? How is the tuning of a cavity resonator carried out?  

\[ 10 \]

Q.3  
a) What do you understand by microwave frequencies? What are their advantages?  
b) What are the applications of microwaves? Briefly describe each.  

\[ 10 \]

Q.4  
a) A rectangular waveguide is filled by dielectric material of \( \varepsilon_r = 9 \) and has inside dimensions \( 7 \times 3.5 \, \text{cm} \). It operates in dominant mode \( \text{TE}_{10} \).  
i) Determine the cutoff frequency.  
ii) Find the phase velocity in the guide at a frequency of \( 2 \, \text{GHz} \).  
iii) Find the guide wavelength \( \lambda_g \) at \( 2 \, \text{GHz} \).  
b) What are microstrip lines? What are their types and characteristics?  

\[ 10 \]

\[ \text{PART-B} \]

Q.5  
a) Briefly describe any two methods for frequency measurement of microwaves.  
b) Describe as to how is measurement of impedance carried out at microwave frequencies using slotted line.  

\[ 10 \]

Q.6  
a) What are the limitations of conventional vacuum tubes for use at microwave frequencies? Briefly explain each limitation.  
b) What is a magnetron? What are its types? Briefly explain the operation of a cavity magnetron.  

\[ 10 \]

Q.7  
Write short notes on any two:  
a) Range ambiguities in radar.  
b) Tunnel diode.  
c) Varactor diode.  
d) GUNN diode.  

\[ 10 \times 2 \]
End Semester Examination, May 2014
B. Tech. –Seventh Semester
DATA COMMUNICATION (EC-703)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) How baud rate is different from bit rate?
   b) Give two applications each of serial and parallel data communication.
   c) What is base band transmission in communication system?
   d) Who makes international standards for telecommunication?
   e) Why RZ or NRZ codes are not used for line transmission?
   f) Why parity bit is required in ASCII code? Explain.
   g) Give two methods of synchronization frame of PCM multiplexer.
   h) Define protocol.
   i) Expand abbreviations: HDB3, SDH, SONET and VOD.
   j) Which media you will use for high bit rate transmission? 2x10

PART-A

Q.2  a) Draw a labeled block diagram of data communication system including each aspect. 10
   b) What are transmission impairments? Explain. 10

Q.3  a) Draw waveform for pattern:
     1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 1 1
     for HDB3 and Manchester code. 10
   b) What are error detection techniques in data transmission? 10

Q.4  a) How many redundant bits you will use for 8-bit character in Hamming code? Explain. 10
   b) Differentiate between synchronous and asynchronous transmissions. 10

PART-B

Q.5  a) Explain flow control protocol used in data link layer. 10
   b) What are bit interleaving and byte interleaving? Explain with diagram. 10

Q.6  a) Explain T1 PCM frame including synchronization of frame and signaling. 10
   b) Explain statistical multiplexer with an example. 10

Q.7  Write short notes on:
   a) VOIP
   b) ADSL 10x2
End Semester Examination, May 2014
B. Tech. – Seventh Semester
WIRELESS AND MOBILE COMMUNICATION (EC-704)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Define TDD and FDD.
   2
b) List the factors which influence the small scale fading in radio propagation channel.
   2
c) What do you understand by an intelligent cell?
   2
d) Write the salient features of CDMA.
   2
e) Explain concept of frequency reuse for cellular networks.
   4
f) Write the difference between wireless communication and mobile communication.
   2
g) Which are the three propagation mechanisms which impact the propagation in a mobile communication system? Explain in brief one of these.
   3
h) Define small scale fading and large scale fading.
   3

PART-A

Q.2
a) Compare the paging system, cordless telephone system and cellular telephone system.
   10
b) In India, various companies are providing mobile communication using different technologies/cellular standards. List and compare these standards.
   10

Q.3
a) Consider a GSM network, which is a TDMA/FDD, that uses 25 MHz for the forward link which and is divided into radio channels of 200 kHz each. If 8 speech channels are supported on a single radio channel, and if no guard band is assumed, find the number of simultaneous users that can be accommodated in the GSM.
   10
b) With the help of a diagram, explain the working of various elements of mobile cellular radio station.
   10

Q.4
a) Describe the free space propagation model to predict the received signal strength.
   15
b) Find the far field distance for an antenna with maximum dimension of 1m and operating frequency of 900 MHz.
   5

PART-B

Q.5
a) What are the main benefits of spread spectrum system? How can spreading be achieved?
   10
b) List the various diversity techniques. Describe one of these.
   10

Q.6
a) Define equalization. Draw a simplified diagram of communication system using an adaptive equalizer. Also describe the general mode of operating an adaptive equalizer.
   10
b) What do you understand by the term quantization? Explain the uniform quantization in detail.
   10

Q.7
Write notes on any two of the following:
i) Rake receiver
ii) TDMA
iii) FHSS
iv) Handoff strategies.
10x2
End Semester Examination, May 2014
B. Tech. – Seventh Semester
RADAR ENGINEERING (EC-721)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) State Doppler frequency effect.
    b) What is maximum unambiguous range of a radar whose pulse repetition period is 800 μsec?
    c) If a radar has an average power of 75 W, duty cycle of 0.15, what will be its peak power?
    d) List any two remedial measures to overcome blind speeds in MTI radar.
    e) If the frequency of received echo signal is lower than the frequency of transmitted signal is the target approaching towards radar or moving away from it.
    f) Define ‘Blind speeds’ for an MTI radar.
    g) On which parameters of a radar, its range resolution and angle resolution depend?
    h) Will maximum unambiguous range of radar increase or decrease when its p.r.f. is increased.
    i) What is a matched filter?
    j) What are the methods used in a MTI radar to reduce clutter residue?

Q.2 a) What are frequency bands used in a radar? What are major applications of radar?
    
    b) Briefly explain the terms:
       i) Peak power, average power and duty cycle.
       ii) Range resolution and angle resolution.

Q.3 a) Derive radar range equation starting from fundamentals. What are its limitations?
    
    b) A radar is operating at 10 GHz, with peak power of 500 kW power gain of antenna is 5000. Minimum signal power the receiver can detect is 10^{-14} W. If the effective antenna aperture is 10 m² and a radar crosssection is 4 m², what will be maximum range of the radar.

Q.4 a) With a block diagram, briefly explain the principle of a CW radar. What are its limitations?
    
    b) What is multi-frequency CW radar? Explain, as to, how the range of a target can be measured in a two frequency CW radar?

Q.5 a) What are the limitations of an MTI radar using delay line canceller? Draw clutter spectrum and output response of a delay line canceller and briefly discuss technique used to reduce the clutter residue.
    
    b) A pulse Doppler radar has a carrier frequency of 9 GHz and p.r.f. of 400 Hz. Find out Doppler frequencies at which blind speeds will occurs. Determine first three blind speeds for this radar.

Q.6 a) What is ‘Range Tracking’ in a radar? Briefly explain how is it carried out in a radar.
    
    b) What is Conical Scan radar? What is its principle? With the help of a block diagram, briefly discuss its operation.

Q.7 Write short notes on any two:
    a) ‘SONAR’.
    b) Receiver Protectors.
    c) Radar Duplexers.

2x10

PART-A

PART-B

10x2
Q.1  
a) Why optical detectors require high sensitivity at operating wavelength?  
b) List the various types of LED.  
c) Find the value of critical angle at core-cladding interface of a silica optical fibre having core refractive index of 1.50 and cladding refractive index of 1.47.  
d) Define responsivity and quantum efficiency.  
e) Sketch the typical spectral variation of the output characteristics with temperature for AlGaAs SLED.  
f) Define numerical aperture and state Snell's law.  
g) What is the basic principle of LASER action?  
h) List various types of LASERS and detectors.  
i) Sketch the output spectrum for InGaAs P SLED and ELED.  
j) List the modulation formats used in optical communication. Define intensity modulation.  

PART-A

Q.2  
a) i) Sketch the electromagnetic spectrum for optical fibre communication system.  
    ii) Write the disadvantages of an optical communication system.  
b) Discuss various applications and advantages of optical fibre communication system.  

Q.3  
a) Using simple ray theory, describe the mechanism for transmission of light within an optical fibre. Briefly discuss with the aid of suitable diagram. What is meant by acceptance angle?  
b) i) Briefly discuss the reason for pulse broadening due to material dispersion in optical fibres.  
    ii) A multimode step index fibre with a core diameter of 60μm and a relative refractive index of difference 1% is operating at a wavelength of 0.80μm. If the refractive index of core is 1.5, determine the normalized frequency for fibre.  

Q.4  
a) Discuss the behaviour of LED at high frequencies.  
b) Define external quantum efficiency. Drive its expression.  

PART-B

Q.5  
a) Explain the distributed feedback lasers. How they differ from distributed Bragg reflection?  
b) With the aid of suitable diagrams, discuss the principles of operation of an injection laser.  

Q.6  
a) Explain the detection process in p-n photodiode and compare this device with the pin photodiode.
b) Derive an expression for the responsivity of an intrinsic photodetector in terms of quantum efficiency.

Q.7 a) Identify the characteristics which are of great interest in the pursuit of high performance receivers.

b) The following parameters are established for a single mode fibre at a wavelength of 1.3 \( \mu m \)

- Mean power launched = -3 dBm
- Cabled loss = 0.4 dB/km, Splice loss = 0.1 dB/km
- Connector loss 1 dB each
- Mean power at APD receiver = -55 dBm
- Safety Margin 7 dB

Estimate the maximum possible link length operating at 35 M/bits.
End Semester Examination, May 2014
B. Tech. – Eighth Semester
BOUNDARY LAYER THEORY (AE-802)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Attempt any ten questions:
   a) Define momentum thickness.
   b) Explain shape factor with relevant significance.
   c) What is the difference between exact solution and approximate method?
   d) Give an expression for Pohlhausen dimensionless quantity (^) and define it with its physical interpretation for two dimensional flows.
   e) Explain the physical significance with formulae of i) Prandtl Number ii) Eckert number.
   f) Define forced and free flow.
   g) Explain briefly the effect of transition over shape factor.
   h) What is intermittency factor? How does it define the physical nature of the flow?
   i) Write a short note on laminar airfoil.
   j) Explain the method of injection of a different gas to control boundary layer control.
   k) Define friction velocity.
   l) What is Prandtl mixing length and explain its importance? 2x10

PART-A

Q.2 a) Derive an expression for displacement thickness with the help of appropriate diagram.
   b) State all the assumptions and mention the physical interpretation briefly.
   c) Define energy thickness? Explain the point of separation.
   d) Explain general properties of boundary layer equation. 5x4

Q.3 a) Explain the two dimensional flow, using the approximate solution method due to Th. Von Karman and K. Pohlhausen. Also derive an expression for the displacement thickness, momentum thickness and viscous stress at the wall using this method.
   b) Derive an exact solution for the axially symmetrical boundary layers for the rotation near the ground with help of a diagram and the theoretical explanation of the flow nature. 10x2

Q.4 a) Simplify the Navier-Stokes Equation, using thermal boundary layer simplification.
   b) Derive the basic energy equation, using the first law of thermodynamics.
   c) Explain how and under what condition, Eckert number behaves like Mach number?
   d) Explain theoretically the effect of Prandtl number over the two boundary layers i.e. Velocity boundary layer and thermal boundary layer. Explain the general properties of thermal boundary layer over the adiabatic wall. 5x4

PART-B

Q.5 Derive Orr-Sommerfeld equation with the help of the method of small distribution for the principle of the theory of stability of laminar flow. Further briefly explain the general properties of Orr-Sommerfeld equation. 20

P. T. O.
Q. 6  a) Explain the following methods of boundary layer control:
  i) Motion of the solid wall
  ii) Suction
  iii) Cooling of the wall
b) Derive the fundamental equations of boundary layer suction with the help of diagram and obtain a theoretical result using the approximation solution method.

Q. 7  a) Explain the mean motion and fluctuations for turbulent flow.
b) Explain apparent or Reynolds stress in detail with all the assumptions.
c) Derive an expression for the stress tensor of Reynolds Stress of turbulent friction from the Navier-Stokes equations. Explain the boundary conditions in detail.
End Semester Examination, May 2014
B. Tech. – Eighth Semester
ROCKET PROPULSION (AE-821)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) State the essential features of a rocket propulsion system.
b) What do you mean by mass ratio of a vehicle? What is the resultant mass ratio for a multi stage rocket?
c) State the importance and application of vacuum insulation technique.
d) State the difference between the effective exhaust velocity and characteristic velocity.
e) What do you mean by 'optimum expansion ratio'? Explain with the help of thrust equation.
f) What do you mean by choked flow?
g) What is sail propulsion concept?
h) What is the approximate percentage of inert mass in booster rocket large launch vehicles?
i) What do you mean by film cooling?
j) Explain the advantages of "Ullage" in a liquid rocket engine. 2x10

PART-A

Q.2 a) With the help of a schematic diagram, explain the essential components and their role in a gas pressure feed liquid propellant engine. State its area of applications and advantages. 10
b) Draw some typical tank arrangement for large turbo-pump fed liquid propellant engines. 5
c) State some of the necessary actions required to observe before loading the cold cryogenic propellant into a flight tank. 5

Q.3 a) For an ideal rocket with characteristics velocity c*=1500 m/s, a nozzle throat diameter of 18 cm, thrust coefficient of 1.38, mass flow rate of propellant of 40 kg/s and propellant mass fraction of 0.6. Compute the chamber pressure, thrust, specific impulse, total impulse, effective exhaust velocity and inert mass of the rocket. 10
b) List down the properties of an ideal rocket. What are the factors that differentiate the rocket exhaust velocity from the rocket effective exhaust velocity? 10

Q.4 a) Differentiate between the boost propulsion and auxiliary propulsion of liquid propellant engine in terms of:
iii) Thrust level. iv) Feed system.
v) Chamber pressure. vi) Propellants. 10
b) Define erosive burning. Explain how it affects the performance of propellant grains? 10

P. T. O.
PART-B

Q.5 Write short notes on the following:
   a) Ablative cooling.
   b) Bell shaped or contour nozzle.
   c) Solar thermal rocket and solar sail
   d) Role of insulator and deflagration limit
   e) Pyrotechnic igniters.  \[4 \times 5\]

Q.6 a) Draw a schematic of a hybrid rocket booster and label its essential components.  \[8\]
   b) List down any five performance characteristics of hybrid rocket engine.  \[5\]
   c) Explain the phenomenon of hybrid regression rate.  \[7\]

Q.7 a) What are the basic subsystems of typical electric propulsion thruster?  \[6\]
   b) With the help of schematic diagram explain in details the arc heating electric rocket propulsion.  \[7\]
   c) With the help of schematic diagram explain the principle and working of electron bondered ion thruster.  \[7\]
INTRODUCTION TO WIND ENERGY (AE-825)

Q.1 Fill in the blanks:
   a) Global extraction limit of wind energy is estimated to be about _______quads.
   b) _______ stresses _______ the blades, axles and bearing material and were a major cause of turbine failure for many years in HWAT.
   c) The controls for the Plum Brook machine consist of a _______ change mechanism as well as a _______ control mechanism at the top of tower for rotating the bed plate at a speed of about 1/24 rpm.
   d) Pumped - hydro applications of wind units.
   e) Wind power can be used in centralized utility applications to drive _______ ac _______ generators.
   f) The advantage of using wind power for heating of buildings in winter time is magnified by the fact that heat losses in buildings are increased by the "_______" factor, and that wind is available for _______ at the very time that wind chill is occurring; thus _______ the need for energy.

   Explain the following:
   g) A wind rose.
   h) What is annual average wind energy density distribution?
   i) Power density of a wind stream for various speeds.
   j) Ducted turbine with a diffuser.

   2x10

Q.2 a) Explain wind resources. 8
   b) Explain the history of wind power in Middle East and Europe. 6
   c) Explain the economic viability of WECS. 6

Q.3 a) Explain the characteristics of lift based devices and drag devices. 6
   b) Explain various types of horizontal axis rotors. 8
   c) Explain Madaras concept for generating electricity. 6

Q.4 a) Describe ERDA-NASA experimental 100 kW units along with its drive train assembly. 12
   b) Explain the lessons learnt from the development and demonstration program for this unit. 8

Q.5 a) Describe a standalone WECS unit. 7
   b) Describe the water pumping application of WECS units. 7
   c) Explain the typical distribution of annual average energy density of winds of various speeds. 6

Q.6 a) Explain the various factors affecting the choice of site for installation of a WECS. 6
   b) Explain the power extraction from a wind stream by an unshrouded wind turbine. 7
   c) How torque output performance of a WECS can be enhanced? Show the speed-torque-curve for a typical optimized rotor. 7

Q.7 a) Explain the extraneous loadings in the operation of a wind machine. 6
   b) Discuss the energy storage options. 7
   c) Discuss the wind – system design synthesis. 7
End Semester Examination, May 2014  
B. Tech. – Eighth Semester  
BASICS OF COMPUTATIONAL FLUID DYNAMICS (AE-827)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1  

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer any five of the following parts. All parts carry equal marks.  
a) What are the pros and cons of obtaining higher order accuracy of difference quotients?  
b) Explain briefly the difference between under-relaxation and over-relaxation.  
c) Explain the concept of staggered grid with proper grid illustrations and why do we need such arrangement.  
d) Define:  
   i) Stability criteria based on the round-off error, and  
   ii) Courant number.  
e) Explain briefly differentiating features of various types of grids.  
f) Define:  
   i) Turbulence kinetic energy and.  
   ii) Probability density function.  

PART-A  

Q.2 a) Define Cramer's Rule. State how it is used for finding the velocity derivatives of quasi-linear partial differential equations.  

b) Discuss briefly the general behavior of hyperbolic, parabolic and elliptic equations. Name the types of flows which are governed by each of the above types of equations.  

Q.3 a) Explain the explicit and implicit approaches for simple one-dimensional heat conduction equation for writing a finite difference equation.  
b) What are the relative advantages and disadvantages of explicit and implicit approaches used for CFD solutions?  

Q.4 Explain the transformations used for the generation of (i) Stretched grids in case of boundary layer flow over a flat surface and (ii) Elliptic grid for flow around airfoil.  

PART-B  

Q.5 Explain the Lax-Wendroff technique for time marching solution of flow parameter. Specify the flow conditions assumed. Write if you feel there is any specific difficulty in using this technique which makes MaxCormack's technique more suitable.  

Q.6 a) What is upwind differencing scheme? Describe the steps followed for deriving a discretised equation for a one-dimensional convective and diffusion problem using upwind differencing scheme.  
b) Write the steps followed for deriving a pressure correction equation using SIMPLE algorithm as proposed by Patankar and Spalding by considering two-dimensional laminar steady flow equations in Cartesian coordinates and following finite volume method.  

Q.7 a) Explain various features of Prandtl's mixing length model.  
b) Explain various transport equations of Reynolds stress model of turbulence and various terms and coefficients associated with this model.  

4x5  
10  
15  
5  
20  
10  
20  
10  
6  
14
End Semester Examination, May 2014  
B. Tech. – Eighth Semester  
MECHANICAL VIBRATION (AU-801)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain briefly:  
a) Periodic motion.  
b) Viscous damping.  
c) Over-damping.  
d) Transmissibility.  
e) Tuned vibration absorber.  
f) Hamilton principle.  
g) Eigen vector.  
h) Transient vibration.  
i) Whirling speed.  
j) Lateral vibration.

2x10

PART-A

Q.2 a) Prove that for underdamped system time period is given by \( \frac{2\pi}{\omega \sqrt{1 - \epsilon^2}} \).  

b) Determine the natural frequency of the spring mass pulley system: 
\[ r = \text{pulley radius}. \]
\[ M = \text{mass of pulley}. \]
\[ m = \text{mass attached to string}. \]
\[ k = \text{stiffness of string}. \]

10

Q.3 a) Explain the working of vibrometer and accelerometer.  

b) Discuss the amplitude and phase response diagram of forced vibration with viscous damping?  

10

Q.4 a) With the help of a neat sketch explain the working of centrifugal pendulum vibration absorber?  

b) Derive the expression for general solution for longitudinal vibration of rod.  

10

PART-B

Q.5 a) Explain Orthogonality principle taking a suitable example.  

b) Prove the relation \( \omega = \sqrt{\frac{g \sum py}{\sum py^2}} \) with the help of Rayleigh method.  

10

Q.6 Represent the periodic motion by harmonic series.

Q.7 a) Represent the following complex number in exponential form:  
   i) \( 4 + 9i \)  
   ii) \( -4 + 3i \)  

b) Represent the following complex numbers in rectangular form:  
   i) \( 10e^{i\frac{\pi}{2}} \)  
   ii) \( 15e^{i2\pi} \)  

20  
10  
10
End Semester Examination, May 2014
B. Tech. – Eighth Semester
COMPUTER AIDED VEHICLE DESIGN (AU-802)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are various types of air fuel cycles used in IC engine?
    b) Write few properties of fuel based on which you will select a fuel?
    c) Define driver’s visibility.
    d) What are the various moments and forces which arise due to vehicle motion in air?
    e) What is mean effective pressure?
    f) Define the terms:
       i) Lift force.
       ii) Rolling moment.
    g) What is a blind spot?
    h) Give the meaning terms: acceleration and gradiability.
    i) What is the objective of vehicle aerodynamics?
    j) What are various mechanisms used in a car?  2x10

PART-A

Q.2 a) What are the different design and operating variables which affect performance and emission of SI and CI engine?  10
    b) Describe various cylinder arrangements and cooling methods used in a CI engine.  10

Q.3 a) Classify car bodies with a neat sketch.  10
    b) Explain design for safety of a vehicle.  10

Q.4 a) Discuss mechanics of air flow around a vehicle.  10
    b) Discuss various crash tests performed on a vehicles.  10

PART-B

Q.5 a) Explain about the modern painting processes for vehicle bodies.  7
    b) Discuss corrosion and anticorrosion methods for vehicles.  6
    c) Define different paint and coats needed.  7

Q.6 Discuss various pressure diagrams of IC engine cycle and derive efficiency and mean effective pressure of Otto cycle.  20

Q.7 a) Discuss the various resistances to vehicle motion.  10
    b) Explain the methods for determining the gear ratios for a vehicle.  10
End Semester Examination, May 2014  
B. Tech. – Eighth Semester  
DNA MICRO-ARRAY (BT-801)

Time: 3 hrs  
Max Marks: 100  
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What are the various database used for DNA micro-array analysis?  
b) Define enlist application of clustering gene expression data.  
c) What do you mean by background correction?  
d) What is the main purpose of using principal component analysis?  
e) What do you mean by discretization of gene expression data?  
f) Define enlist two limitations of steady state approach.  
g) How physical map is different from genetic map?  
h) Enumerate the advantages of feature selection.  
i) What do you mean by genotyping?  
j) What do you mean by Euclidean distance?  

2x10

PART-A

Q.2  
What is the most appropriate way to measure the similarity of expression between different genes? Explain it with a suitable example.  

20

Q.3  
a) What is the purpose of hybridization in DNA micro-array technology? Explain.  
b) How data analysis is done after hybridization?  

10  
10

Q.4  
a) Explain one method used to visualize the data scattered in the dimensional hyper plane.  
b) Give an account of parallel sequencing to analyze expression data.  

10  
10

PART-B

Q.5  
a) How experiment design can help in independent verification and interpretation of result from micro-array data?  
b) Enumerate the advantages of hypothesis driven experiment.  

14  
6

Q.6  
a) State one method and one model used for genotyping.  
b) Give an account of feature selection of micro-array data.  

12  
8

Q.7  
a) Explain different types of gene network in context to reverse engineering of regulatory network.  
b) Discuss the advantages of network modeling.  

15  
5
End Semester Examination, May 2014
B. Tech. – Eighth Semester
BIOSAFETY AND IPR (BT-802)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) How can biotechnology help to save "biodiversity"?
    b) What are biological hazards?
    c) How can you classify biocontainment?
    d) When was the Cartagena protocol enforced?
    e) What kind of risks are associated with biotechnology?
    f) What are patent claims?
    g) What do you understand by competitive research?
    h) Define bioterrorism.
    i) What is trade mark?
    j) Elaborate Plant Variety Protection Act. 2x10

   PART-A

Q.2 a) Discuss the socio-economic impacts of biotechnology. How will you address the
     ownership and monopoly issues connected to biotechnology? 12
     b) Explain the term: Benefit sharing in this regard. 8

Q.3 a) What kind of ethical conflicts arise in biotechnology?
     b) How can these be addressed? Assess the role of IPR in this context. 10

Q.4 a) What are the bio safety issues in plant molecular forming?
     b) Discuss the ethical issue related to transgenic food crops. 10

   PART-B

Q.5 a) What do you understand by ecological safety assessment of recombinant
     organisms? 10
     b) Enlist the biosafety measures adopted in a biotechnology laboratory. 10

Q.6 a) How can one test the novelty of plants?
     b) What is a copyright? How can it be exercised? 10

Q.7 a) Discuss the IPR strategies of protecting farmers rights.
     b) What is the role of patenting in pharmaceutical industry? 10
End Semester Examination, May 2014
B. Tech. – Eighth Semester
MEDICAL MICROBIOLOGY (BT-821B)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following in brief:
   a) Differentiate between exogenous and endogenous infections.
   b) Differentiate between exotoxin and endotoxin.
   c) Differentiate between active and passive immunization.
   d) Differentiate between killed and live attenuated vaccines.
   e) Define infectivity and virulence.
   f) Name any two food borne diseases and their causal organisms.
   g) Define pathogenicity.
   h) Define AIDS? And what is its causative organism.
   i) What are interferons?
   j) What do you understand by drug resistance?  2x10

PART-A

Q.2 a) What is medical microbiology? Give the historical background of medical microbiology.  10
   b) Define infection? List some sources of infection for man. Explain mode of transmission of infection.  10

Q.3 a) What is a disease? How does a disease progress and what are the different ways of transmission of a disease?  10
   b) Explain mechanism of drug resistance in microbes.  10

Q.4 a) Explain bacterial, viral and fungal cultivation by conventional and advanced methods.  10
   b) Explain molecular methods for diagnosis of microbial diseases.  10

PART-B

Q.5 a) What are retroviruses? Differentiate RNA +ve and RNA –ve viruses. Explain the replication of retroviruses in a cell.  10
   b) Write short notes on:
       i) Recombinant proteins.
       ii) Viral vaccines.  5x2

Q.6 What is the causal organism of cholera? Explain epidemiology, pathogenicity, diagnosis, prevention and its control.  20

Q.7 a) What is chemotherapy? Explain prevention and control of diseases by chemotherapy.  10
   b) Give a note on recombinant vaccines.  10
End Semester Examination, May 2014
B. Tech. – Eighth Semester
BIOENERGY (BT-821C)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer briefly:
   a) Define carry capacity.
   b) Explain advantages of vertical axis turbine.
   c) Differentiate between fuel cell and battery.
   d) Discuss tip-speed ratio.
   e) Describe advantages of hydrogen energy.
   f) Explain a dry steam power plant.
   g) Discuss hydrogen energy production and applications.

   PART-A

Q.2 "Energy growth is the measure of prosperity”. Justify the statement.

Q.3 Discuss various aspects related to solar energy.

Q.4 What is a fuel cell? Discuss classification, working and applications of fuel cells.

   PART-B

Q.5 What is biomass? How energy can be produce from it?

Q.6 Why is energy conservation and management one of the most important concerns in the world?

Q.7 Write short notes on:
   a) Biofuels.
   b) Municipal solid waste management.

   10x2
End Semester Examination, May 2014
B. Tech. – Eighth Semester
ESTIMATING AND COSTING (C-801)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain principle of estimation.
b) Write down any three purposes of rate analysis.
c) Name any three factors on which value of any property is dependent.
d) Define item rate contract.
e) What do you understand by first and final payment?
f) Write down the importance of a measurement book.
g) Mention the meaning of earnest money.
h) What items are covered under overhead/establishment charges?
i) Explain the difference between cost and value.
j) What do you understand by acceptance of a tender?

2x10

PART-A

Q.2 From the sketch of a given building as shown in figure (given on page-2) calculate the quantities and prepare an abstract of quantities for the following items of work:
a) Lean concrete 1:4:8 in foundation.
b) DPC 1:2:4 40 mm thick.
c) Brick work in foundation and plinth.
d) Flooring.

20

Q.3 a) Write a short note on specifications.
b) Write down specifications of cement concrete in detail.

8

12

Q.4 a) Rate analysis of any item depends on a large number of factors. Describe item in detail.
b) Work out rate analysis for 10 cum of RCC 1:2:4 excluding formwork and reinforcement.

10

10

PART-B

Q.5 a) What all important information is required to be given in a tender notice? Discuss them in detail.
b) Write short notes on:
   i) Administrative approval.
   ii) Technical sanction.

30

Q.6 a) List out types of contract and discuss advantages and disadvantages of any two in detail.
b) Write a short note on various purposes of an approximate estimate.

10

10

Q.7 a) The value of a building can be found out by many methods. List them and discuss any one in detail.
b) A property located in Sector-21 Faridabad has been purchased for Rs. 6,00,000/- excluding the cost of land. Determine the amount of sinking fund deposited at the rate of 5% compound interest. Assume the future life of building as 30 years and scrap value of building material as 8% of the cost of purchase.

8

12

P. T. O.
NOTES:

1. All dimensions are in mm.

2. All brick work shall be 200 thick.

3. Door 1: 0.90M x 2.10M

4. Window W1: 1.50M x 1.35M

**SECTION AT A - A**

**PLAN FIGURE I (a)**

- Room 1: 4000 x 5000
- Room 2: 6000 x 5000

**EXTRACTION DETAIL**

- Foundation Footing
- Wall Thickness
- Window Sill

**SECTION AT A - A** (Figure 16)

- Foundation Footing
- Wall Thickness
- Window Sill

**PLAN FIGURE I (a)**

- Room 1: 4000 x 5000
- Room 2: 6000 x 5000

**NOTES:**

1. All dimensions are in mm.

2. All brick work shall be 200 thick.

3. Door 1: 0.90M x 2.10M

4. Window W1: 1.50M x 1.35M
Q.1 Explain the following:
   a) Misrepresentation of contract.
   b) Coercion.
   c) Sorting of tender.
   d) Tallying of tender.
   e) Web based tender.
   f) Bid capacity.
   g) Working drawing.
   h) Scales used for drawings.
   i) Retention money.
   j) Reference specification.

\[2 \times 10\]

**PART-A**

Q.2 a) Explain module of Global tender inviting process by conventional and web based technology for execution of National Highway situated in the Noida. The price of the contract is 31 Crores.  

\[10\]

b) Briefly explain the flow chart for design stage of tendering.

\[10\]

Q.3 a) What is specification? Explain its different types.

\[10\]

b) Explain:
   i) Earnest deposit
   ii) Different types of security deposit.

\[5 \times 2\]

Q.4 a) Explain briefly the steps involved in evaluating tender.

\[10\]

b) List the deficiencies in the preparation of tenders and explain any two.

\[10\]

**PART-B**

Q.5 a) Give details of ‘Sale of tender documents’. Also write down about ‘Accounting of tender documents’.

\[10\]

b) Give the operational functions of an evaluation panel. Also draw the chart for pre-tender opening.

\[10\]

Q.6 a) Discuss in brief regarding "Indian Contract Act".

\[10\]

b) Write down about 'Development of Indian Contract Act'.

\[10\]

Q.7 a) What is "Arbitration Act"? Explain in brief.

\[10\]

b) What do you understand by "Arbitration in Suits"? Explain.

\[10\]
End Semester Examination, May 2014
B. Tech. – Eighth Semester
HYDROLOGY (C-803)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Define the following terms.
a) Area-Duration relationship
b) Mean precipitation
c) Evaporation
d) Evapo-transpiration
e) Infiltration
f) \( \phi \)-Index and \( \omega \)-Index
g) Direct runoff and base flow
h) Run-off volume
i) Synthetic unit hydrograph
j) Aquifers and aquicludes.

\[ 2 \times 10 \]

**PART-A**

Q.2 a) Describe different methods of recording of rainfall.

\[ 10 \]

b) The normal annual rainfall at stations A, B, C, D in a basin are 80.97 cm, 67.59 cm, 76.28 cm and 92.01 cm. In a particular year, the station D was inoperative and the stations A, B, C recorded annual precipitation of 91.11 cm, 72.23 cm and 79.89 cm. Find the rainfall value at station D.

\[ 10 \]

Q.3 a) Discuss briefly the various abstractions from precipitation.

\[ 10 \]

b) A reservoir had an average surface area of 20 km² during June 1982. In that month the mean rate of Inflow=10 m³/s, outflow=15 m³/s, monthly rainfall=10 cm, change in storage=16Mm³. Assuming the seepage losses to be 1.8 cm. Estimate the evaporation in that month.

\[ 10 \]

Q.4 a) The mass curve of rainfall of 100 min duration is given below. If the catchment had an initial loss of 0.6 cm and a \( \phi \)-index of 0.5 cm/hr, calculate the total surface runoff from the catchment.

<table>
<thead>
<tr>
<th>Time of rainfall (min)</th>
<th>0</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative rainfall (cm)</td>
<td>0</td>
<td>0.5</td>
<td>1.2</td>
<td>2.6</td>
<td>3.3</td>
<td>3.5</td>
</tr>
</tbody>
</table>

\[ 10 \]

b) Explain briefly the infiltration process and how the measurement of infiltration takes place.

\[ 10 \]

**PART-B**

Q.5 a) What is stage? Also discuss about the manual gauges and automatic stage recorders.

\[ 10 \]

b) During the passage of a fluid, following data was estimated at 2 sections separated at 500 m.

<table>
<thead>
<tr>
<th>Surface</th>
<th>Water Surface Elevation</th>
<th>Area of flow</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>U/S</td>
<td>85.23 m</td>
<td>91.746 m²</td>
<td>2.835</td>
</tr>
<tr>
<td>D/S</td>
<td>85.176 m</td>
<td>84.354 m²</td>
<td>2.917</td>
</tr>
</tbody>
</table>

P. T. O.
Eddy loss coefficient for gradual contraction is 0.1 and for gradual expansion is 0.35. Estimate the flood discharge passing through the channel, if value of manning coefficient is 0.022. (R-hydraulic radius).

Q.6
a) Explain the term rainfall excess. Also discuss the factors affecting a hydrograph.
b) Ordinates of a 3 hour UH are given below. Find the ordinate of 6 hr UH using S-curve:

<table>
<thead>
<tr>
<th>Time (hrs)</th>
<th>0</th>
<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
<th>15</th>
<th>18</th>
<th>21</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordinate of 3hr UH</td>
<td>0</td>
<td>20</td>
<td>50</td>
<td>60</td>
<td>50</td>
<td>40</td>
<td>20</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>

Q.7
a) What are the saturated formations? Explain properties of any one saturated formation in detail.
b) Derive expression for the steady state radial flow into a well under both confined and unconfined aquifer conditions.
End Semester Examination, May 2014
B. Tech. – Eighth Semester
FOUNDATION ENGINEERING (C-804)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Why is it essential to check stability of slope?
     b) Define factor of safety in terms of shear strength.
     c) What do you mean by passive earth pressure?
     d) Name different types of sheet piles.
     e) Define area ratio.
     f) If SPT N value in cohesive soil is 8, then denseness of soil is ________.
     g) Explain the term net ultimate bearing capacity.
     h) List various methods of boring.
     i) Define natural frequency.
     j) A pile foundation is used when ________.  

     2x10

**PART-A**

Q.2  a) With the help of a neat sketch, explain different types of slope failures.  
     b) How slope is analyzed using Swedish circle method? Derive an expression for the factor of safety.

     5  
     15

Q.3  a) Compare Rankine’s theory and Coulomb’s theory.  
     b) What are assumptions of Rankine’s theory? Derive an expression for active earth pressure.

     5  
     15

Q.4  a) What are different types of sheet pile walls? Draw the sketches showing the pressure distribution for free cantilever sheet pile.
     b) Explain equivalent beam method for design of anchored bulkheads.

     10  
     10

**PART-B**

Q.5  a) What are the factors that affect the sample disturbance? How are these effects minimized?
     b) What are different types of shallow foundations? Explain with the help of a sketch.

     10  
     10

Q.6  a) A strip footing 2 m wide is to be laid at a depth of 4 m in a purely cohesive soil (c=150 kN/m², \( r=19 \) kN/m³). Determine the ultimate bearing capacity from Terzaghi’s theory. Take \( N_c=5.7 \), \( N_s=1.0 \).
     b) Discuss the effect of water table on the bearing capacity of the soil.

     10  
     10

Q.7  a) Determine the coefficient of uniform compression if a vibration test on a block 1m×1m×1m gave a resonance frequency of 30 Hz in the vertical direction. The mass of the oscillator used was 60 kg.
     b) Explain the following terms:
        a) Magnification. 
        b) Transmissibility. 
        c) Resonance. 
        d) Period.

     10  
     10
End Semester Examination, May 2014
B. Tech. – Eighth Semester
ADVANCED TRAFFIC ENGINEERING (C-824)

Time: 3 hrs  Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What do you understand by PCU? 
b) Define traffic engineering as per PIARC. 
c) "Superelevation is an important factor in design of roads". What do you understand by it? 
d) Mention at least four parts of a vehicle that contribute to generation of noise. 
e) Draw the basic flow diagram for the organizational setup of a traffic engineering department in India. 
f) What do you understand by all red time and phase in a traffic signal design? 
g) Define road pricing. 
h) Explain the various types of traffic signs in brief. 
i) Write the relationship between speed, volume, capacity and density. 
j) Define basic capacity of road.  2x10

PART-A

Q.2  
a) Enumerate the different methods of carrying out traffic volume studies. Discuss the principle of each.  10 
b) A vehicle travelling at 40 kmph was stopped in 2 seconds after the application of brakes. Determine the average skid resistance and braking distance. Assume any value if required.  5 
c) What are the different vehicular characteristics which affect the road design? Briefly explain.  5

Q.3  
a) Traffic survey is done with certain aims. State them? Describe speed and delay study in detail  10 
b) Two vehicles A and B of equal weight, approaching from cross roads (at right angles) collide with each other. They skid through distances 30 m and 15 m before collision and 20 m and 35 m, respectively after collision. If the directions of skidding vehicles A and B after collision are 45° and 130° with original path, respectively, calculate the original speeds of the two vehicles before the application of brakes. Assume $f=0.55$.  10

Q.4  
a) Explain the level of service concept while deciding the design capacity of a road.  10 
b) What is the aim of traffic engineering? Describe in detail various functions that a traffic engineer has to perform.  10

PART-B

Q.5  
a) Explain various types of traffic signals and their functions. How are the signal timings decided?  10 
b) An isolated signal with pedestrian indications is to be installed on a right angled intersection with road A, 18 m wide and road B, 12 m wide. The heaviest volume per hour for each lane of road A and road B are 230 and 280, respectively. The

P. T. O.
approach speeds are 55 and 35 kmph for A and B, respectively. Design the timings of traffic and pedestrian signals.

Q.6  
   a) Describe in detail the advantages and disadvantages of one-way street or traffic.  
   b) Why there is a need for traffic regulation? Also explain the scope of traffic regulation and traffic management.

Q.7  
   a) What are the factors that affect fuel consumption of a motor vehicle? Also write down the fuel properties to be considered.
   b) Write short notes on:
       i) Vehicular air pollution and vehicular emission.
       ii) Alternate fuels and arboriculture.
End Semester Examination, May 2014
B. Tech. – Eighth Semester
DISTRIBUTED OPERATING SYSTEMS (CS-825)

Time: 3 hrs

Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Why is distributed operating system preferred over centralized systems?
   b) State the taxonomy of parallel and distributed computer systems with help of a neat labelled diagram.
   c) What is meant by an open system? Why are some systems not open?
   d) State the properties that a distributed algorithm must have.
   e) Why deadlock avoidance is never used in distributed systems?
   f) Define “Clock Skew”. What is its consequence over OS?
   g) What is the difference between mutex and condition variable?
   h) Distinguish between file server and file services.
   i) Define Munin. What are the classes of variables that it supports?
   j) Mention the primary goals of MACH.

   \( \text{2x10} \)

PART-A

Q.2 a) Explain how is communication achieved in a distributed system using ATM model.
   \( \text{7} \)

b) Differentiate between tightly-coupled and loosely-coupled systems. Also explain various operating systems that are formed by possible combination of tightly-coupled and loosely-coupled hardware and software.
   \( \text{7} \)

c) Briefly explain various design issues for group communication.
   \( \text{6} \)

Q.3 a) “Synchronization in a distributed system is more complex than in centralized one”. Justify the statement. Also explain how the clock synchronization issue is handled using logical clock concept.
   \( \text{13} \)

b) What is mutual exclusion? Discuss any two algorithms used to ensure mutual exclusion in a distributed system.
   \( \text{7} \)

Q.4 a) What are real-time systems? Depending upon the deadline, what are types of real-time systems? What are unique design issues that these systems have? Explain in detail.
   \( \text{13} \)

b) Why is scheduling needed in a distributed system? How is it done? Explain the concept of co-scheduling in detail.
   \( \text{7} \)

PART-B

Q.5 a) What is a distributed file system? Explain various ways provided by distributed file system of doing caching in client memory.
   \( \text{13} \)

b) List and explain the various latest trends in a distributed file system.
   \( \text{7} \)

Q.6 a) Name and explain various consistency models that are used to achieve consistency in distributed shared memory.
   \( \text{12} \)

b) Explain how page replacement and synchronization take place in page-based distributed shared memory.
   \( \text{8} \)

Q.7 a) How is communication in MACH supported by ports? Also state the primitives for managing ports.
   \( \text{10} \)

b) Write short notes on:
   i) UNIX emulation in MACH
   \( \text{10} \)

   ii) Virtual memory in MACH
End Semester Examination, May 2014
B. Tech. – Eighth Semester
ADVANCED TELEVISION ENGINEERING (EC-801)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) Why is scanning necessary in TV transmission?  
b) What is meant by the deflection angle of a picture tube?  
c) What is Grassman’s Law?  
d) List two advantages of digital TV.  
e) A 200 W carrier signal is modulated to a depth of 50%. Calculate the total power in the modulated wave.  
f) What do you understand by image rejection ratio?  
g) What is the need for modulating a signal?  
h) Why is yoke placed close to the neck of picture tube?  
i) Calculate the percentage interface error when the second field is delayed by 8 \( \mu \)s.  
j) Mention any two requirements that must be met to make a colour system fully compatible.  

2x10

PART-A

Q.2  
a) Sketch the details of horizontal blanking and sync pulses. Label on it:  
   i) Front porch.  
   ii) Horizontal sync pulse.  
   iii) Back porch.  
   iv) Active line period.  
   Why are the front porch and back porch intervals provided before and after the horizontal sync pulse? Explain why the blanking pulses are not used as sync pulses?  

15

b) Justify the choice of rectangular frame with width to height ratio= \( \frac{4}{3} \) for TV transmissions and reception.  

5

Q.3  
a) Show that in the 625 B system, a total channel bandwidth of 11.25 MHz would be necessary if both the sidebands of the amplitude modulated picture signal are fully radiated along with the frequency modulated picture signal.  

12

b) What are the demerits of vestigial sideband transmission?  

8

Q.4  
a) Discuss the merits of electromagnetic deflection over electrostatic deflection in television picture tubes.  

10

b) Describe briefly the factors that influence the choice of picture IF= 38.9 MHz and sound IF= 33.4 MHz in the 625 B monochrome TV system.  

10

PART-B

Q.5  
a) Describe with a suitable diagram the construction and working of PIL colour picture tube.  

10

b) Explain the following terms:  
   i) Luminance signal  
   ii) Hue

P. T. O.
iii) Saturation
iv) Chrominance
v) Additive mixing

Q.6  a) Explain how by frequency interleaving, the colour information is accommodated within the same channel bandwidth of 7 MHz.
    b) What is the function of television receiver antenna? Give an example of receiver antenna and explain it in detail.

Q.7  Write short notes any four:
    a) Cable TV.
    b) LCD TV.
    c) Picture phone and facsimile.
    d) HDTV.
    e) IPTV.
Q.1  
   a) What are the advantages of geostationary satellites?
   b) Explain the basic difference between an active and passive satellite system.
   c) Explain, what is meant by apogee height and perigee height? A satellite has an
      apogee height of 39,342 km and a perigee height of 613 km. Determine the
      semi-major axis and the eccentricity of its orbit. Assume a mean earth radius of
      6371 km.
   d) A satellite is orbiting in a geosynchronous orbit of 41500 km. Find the velocity and
      time of orbit.
   e) What is meant by effective isotropic radiated power (EIRP)? A transmitter feeds a
      power of 10 W into an antenna which has a gain of 46 db. Calculate the EIRP in
dBW.
   f) What is meant by threshold in an FM detector? Explain FM improvement and write
      the expression for S/N ratio for SCPC signals.
   g) Explain as to why time division multiplexing is the only option for digital satellite
      link and also why the intermodulation effects are not prevalent in TDM.
   h) What is a burst? What is the difference between the reference burst and traffic
      burst in TDMA frame.
   i) Discuss the advantages and disadvantages of optical satellite communication.
   j) The range between a ground station and a satellite is 42,000 km. Calculate the
      free space loss at a frequency of 6 GHz.

   PART-A

   Q.2  
   a) List various frequency bands being used in satellite communication. Compare the
      advantages and disadvantages of different bands considering the effects of
      propagation media.
   b) In what way satellite has an edge in communication compared to other methods?
   c) Explain in detail, the elements of satellite communication system.

   Q.3  
   a) Name the orbital aspects which are of importance in synchronous satellite
      communication. Explain these aspects in detail.
   b) Explain as to how does the solar eclipse affect the working of a communication
      satellite.
   c) What is meant by station keeping of satellite? Explain its significance and also the
      methods to achieve it.

   Q.4  
   a) Derive general link equations. Find out expressions for C/N and G/T ratios. Explain
      the importance of these ratios on satellite link design.
   b) A satellite at a distance of 40,000 km from a point on the earth's surface radiates
      a power of 2 W from an antenna with a gain of 17 dB in the direction of observer.
      Find the flux density at the receiving point, and the power received by an antenna
      with an effective area of 10 m². If the operating frequency of satellite is 11 GHz
      and the receiving antenna has a gain of 52.3 dB, find the received power.

   P. T. O.
PART-B

Q.5  a) What is loading factor and how does it affect the FM/FDM signal transmission? For a 60 channel FDM system with a maximum baseband frequency of FM = 252 kHz and a specified top channel signal to noise ratio S/N = 52 dB, find out the bandwidth. The FDM multichannel rms frequency deviation is 546 kHz. Also, find out the FDM multichannel loading factor, test tone rms frequency deviation and C/N ratio. The improvement in emphasis and psophometric weighting is around 6.5 dB.
   b) Derive an expression for a digital satellite link and explain as to how is it dependant on the system bandwidth.  

Q.6  a) What is meant by burst time plan? Explain its structure and importance.
   b) What is CDMA? In what way is it superior to TDMA? Mention the potential applications of CDMA.

Q.7  a) Explain optical satellite link transmitter and receiver.
   b) Write a short note on satellite beam acquisition.
End Semester Examination, May 2014
B. Tech. – Eighth Semester
MOBILE COMPUTING (EC-823)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) List various layers of WAP1.X protocol.
   b) Explain briefly HLR and VLR.
   c) What do you understand by client and server?
   d) Write an expression for reuse co-channel ratio and explain various parameters in the expression.
   e) List three stages of client of CODA file system.
   f) What is encapsulation; list any two techniques of encapsulation.
   g) Define Uni-casing and Broadcasting.
   h) What do you understand by Mobile IP?
   i) What do you understand by IP Micro Mobility support? Name any one technique.
   j) What do you understand by transaction model? List any two types of transactions.

PART-A

Q.2 a) What do you understand by frequency-reuse and derive an expression for capacity of mobile N-cell cellular system, given the spectrum as ‘S’ channels? 8
   b) What do you understand by spread spectrum multiple access technique? Explain the working of CDMA with the help of a diagram and discuss the salient features of CDMA channels. 12

Q.3 With the help of a diagram, explain the generic WATM reference model and various access scenarios. 20

Q.4 Explain the functions of various components of WAP 2.0 architecture. 20

PART-B

Q.5 a) What do you understand by a distributed file system? Briefly discuss the architecture of CODA file system. 12
   b) Briefly discuss the states of Client in a CODA file system. 8

Q.6 a) Discuss fundamental differences between Wired Network and Adhocwireless Networks from the point of routing. 10
   b) Discuss Flat Adhoc Routing and its merits and demerits. 10

Q.7 Write short notes on any two:
   a) Snooping TCP.
   b) Audio digital broad casting.
   c) Packet delivery to and from mobile node.
   d) Kangaroo and Joey transaction. 10x2
End Semester Examination, May 2014
B. Tech. – Eighth Semester
ADVANCED MICROPROCESSOR AND MICROCONTROLLERS (EC-824)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What is an interrupt poll and an interrupt poll register?
    b) Explain the function of LOCK and ARDY pin of 80186 microprocessor.
    c) How much physical memory can a 80386 microprocessor address in real mode and in protected mode?
    d) What do you mean by paging system?
    e) What are level-1 and level-2 cache memory systems? Give examples of both.
    f) What is the relevance of AV bit in a descriptor?
    g) What is the purpose of PWM unit in an 80196 microcontroller?
    h) What is super scalar architecture?
    i) What is MIPS/ Watt?
    j) What is the purpose of relocation register?

    2x10

PART-A

Q.2  a) What is PCB? Write the instructions to relocate the memory 50,000 H to new address 20,000 H.
    b) Explain the architecture of an 80186 microprocessor with the help of a suitable block diagram.

    10

Q.3  a) Briefly explain the protocol mode addressing.
    b) Explain the function of following pins:
       i) PEREQ.
       ii) LOCK.
       iii) M/IO.
       iv) BST6.
    c) Explain the memory system of an 80386 microprocessor.

    10

Q.4  a) What is the purpose of cache memory in an 80486 microprocessor?
    b) With the help of a suitable diagram, explain the programming model of an 80486 microprocessor.

    8

    12

PART-B

Q.5  a) Draw and explain the architecture of an 80196 MCU.
    b) Explain I/O ports in single chip mode and the port multiplexing signals in expanded mode.

    10

Q.6  a) Explain 80196 family software timer. How does its software differ from a real time clock ISR?
    b) List the addressing modes used in 80196 MCU instruction set. Give exemplary use of each mode.

    10

Q.7  Write short notes on any two:
    a) Programmer model for ARM.
    b) Memory paging.
    c) RISC vs CISC.

    10x2
End Semester Examination, May 2014
B. Tech. – Eighth Semester
ADVANCED CONTROL SYSTEMS (EE-801)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) What are the limitations of transfer function model?
     b) Define a state variable.
     c) Define controllability.
     d) State two properties of state transition matrix.
     e) What are the advantages of sampled data system over continuous time systems?
     f) Define a limit cycle.
     g) What are different types of nonlinearities in a system?
     h) Define acquisition time.
     i) Define asymptotic stability of a system.
     j) Find the inverse Z transform of \( \frac{1}{Z+b} \). 2x10

PART-A

Q.2  a) Obtain the state space model of a closed loop feedback system whose transfer function is:
     \[ \frac{y(s)}{u(s)} = \frac{10(s+4)}{s(s+1)(s+3)} \]
     b) The \( A, B, C \) matrices of a state space model is given by:
     \[
     A = \begin{bmatrix} 0 & 1 & 0 \\ 3 & 0 & 2 \\ -12 & -7 & -6 \end{bmatrix}, \quad B = \begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}, \quad \text{and } C = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix}
     \]
     Obtain its Eigenvalues, Eigenvectors and modal matrix. 10

Q.3  a) Determine \( e^{At} \) using any two methods. \( A = \begin{bmatrix} 0 & 1 \\ -8 & -6 \end{bmatrix} \)
     b) Test the observability of the system:
     \[
     \dot{x} = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u \\
     y = [2 \ 1] x
     \]
     10

Q.4  a) Find the Z transform of:
     i) \( F(z) = \frac{4z^2 - 2z}{(z-1)(z-2)^2} \)
     ii) \( \frac{Z}{2 - 3z^{-1} + z^{-2}} \)
     b) Find the pulse transfer function of the following system:

     \[
     R(s) \quad E(s) \quad \frac{s+1}{s} \quad \frac{s+3}{s} \quad C(s)
     \]
     10

P. T. O.
End Semester Examination, May 2014
B. Tech. – Eighth Semester
UTILIZATION OF ELECTRIC POWER AND TRACTION (EE-821)

Time: 3 hrs
Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
a) What is meant by a welding electrode?
b) What properties are considered for selecting material for heating element?
c) Why sodium discharge lamps are not used for general lighting?
d) Why electric heating is preferred over forms of heating?
e) Explain Lambert’s cosine law.
f) Why series motor are preferred for electric traction?
g) Explain the following terms:
i) Luminous intensity ii) Illumination
h) Explain regenerative braking.
i) What do you mean by dead weight and adhesive weight of a locomotive?
j) Discuss the properties of refrigerants. 2x10

PART-A

Q.2  
a) Describe the construction and principle of operation of mercury vapour lamp. 10
b) A room 40 m \times 24 m \text{ is illuminated by indirect lighting, an average illumination of } 50 \text{ lux is required to illuminate the working plane. } 80 \text{ Watt filament lamps having luminous efficiency of } \text{16 lumen/W are to be used. The coefficient of utilization is 0.75 and depreciation factor is 0.85. Calculate the following: i) Gross lumens required ii) Power required for illumination iii) Number of lamps iv) Find the savings in power if instead of }80-W \text{ filament lamps, }30-W \text{ watt fluorescent tubes are used having efficiency of } \text{40 lumen/W. Also find the number of tube lights required.} 10

Q.3  
a) Explain the method of induction heating and describe in detail the coreless type of induction furnace. 10
b) Explain dielectric heating. Explain the factors on which the dielectric loss in a dielectric material depends. Discuss some of its applications. 10

Q.4  
a) Discuss the principle of arc welding and explain the difference between carbon and metallic arc welding. 10
b) Explain the principle of spot and seam welding with proper diagrams. 10

PART-B

Q.5  
a) What do you mean by electrodeposition. Discuss in detail the factors on which the quality of electrodeposition depends. 10
b) What is electrolysis? What are its applications? State Faraday’s law of electrolysis and explain them clearly? 10

Q.6  
a) Draw and explain a typical speed-time curve for an electric train and what do you understand by crest speed, average speed and schedule speed. 7
b) Discuss in brief the tractive effort for propulsion of train. 6

P. T. O.
c) The speed-time curve of train carries the following parameters:
   i) Free running for 12 minutes.
   ii) Uniform acceleration of 6.5 kmphps for 20 sec.
   iii) Uniform deceleration of 6.5 kmphps to stop the train.
   iv) A stop of 7 minutes.
   Then determine the distance between two stations, the average and the schedule speeds.

Q.7  a) Explain with the help of a diagram the working of window type room air conditioner.
     b) What do you mean by water cooler? Discuss in detail its various types.
End Semester Examination, May 2014
B. Tech. – Eighth Semester
ELECTRICAL POWER QUALITY (EE-822)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Explain the term power quality.
   b) What is total harmonic distortion?
   c) What are the effects of poor power quality?
   d) Define sag and swell.
   e) Under what condition can an interruption occurs?
   f) Define DC offset, inter harmonics.
   g) Define wastage unbalance.
   h) Name any four IEC international power quality standards.
   i) Define total demand distortion.
   j) Define active filter.

Part-A

Q.2 a) Name the different sources of transient over voltages and explain the capacitor switching transient.
    b) Explain the power system response characteristics under the presence of harmonics.
    
Q.3 a) Discuss the origine of short interruption. How will you monitor and mitigate short interruption? Explain.
    b) Define lightening. Discuss in details about the over voltages due to lightening and the problem associated with it.

Q.4 a) What is the need for protection against over voltages? Explain the basic principle of over voltage protection.
    b) What is power factor? Discuss various techniques for power factor correction.

Part-B

Q.5 a) Explain the concept of harmonic phenomena under the presence of harmonic producing loads.
    b) What are the various sources of harmonics? Explain briefly.

Q.6 a) What is the significance of power quality monitoring? Give the important power quality monitoring objectives.
    b) What are the various instruments used for power quality measurements? What are the factors to be considered when selecting the instruments?

Q.7 Write short notes on:
   a) Harmonic analyzer.
   b) Transient disturbance analyzer.
   c) Data loggers and chart recorders.
End Semester Examination, May 2014
B. Tech. – Eighth Semester
TOTAL QUALITY MANAGEMENT (HM-623)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Explain in brief:
   a) Quality,
   b) Quality planning.
   c) Pillars and TQM.
   d) Basic concepts of TQM.
   e) Dimensions and quality.

   4x5

   PART-A

Q.2 How is quality linked to the cost of a product? What are the components of a quality cost? Explain quality and cost relationship with a neat sketch.

   20

Q.3 How employer involvement works in maintain TQM in a organization? Explain.

   20

Q.4 a) Explain ‘Seven Management Tools’ and how do they act?
   b) Explain ‘Quality Circle’.

   10

   10

   PART-B

Q.5 What is ‘Quality Function Deployment’ (QFD) and explain its process?

   20

Q.6 Explain how quality is interconnected with organizational culture?

   20

Q.7 Explain ‘Quality Auditing’ and what is its need.

   20
End Semester Examination, May 2014
B. Tech. – Eighth Semester
MARKETING MANAGEMENT (HM-821)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TW0 questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Write short notes on the following:
   a) Supply chain.
   b) Strategic business units.
   c) Marketing intelligence systems.
   d) Psychographic segmentation.
   e) Maslow motivation theory.
   f) Differentiated pricing.
   g) Multi channel marketing.
   h) Cause-related marketing.
   i) Customer perceived value.
   j) Marketing plan. 2x10

PART-A

Q.2 a) Explain in detail the holistic marketing concept. 10
   b) What is marketing plan? Elaborate the various contents of marketing plan. 10

Q.3 a) What is marketing research system? Explain in detail the marketing research process. 8
   b) Explain the following terms:
      i) Order to payment cycle
      ii) Customer value
      iii) Databases role in marketing
      iv) Economic environment 3x4

Q.4 a) Explain the buying five stage model decision process in detail. 10
   b) What is motivation? Explain the motivation theories as given by Freud and Herzberg. 10

PART-B

Q.5 a) What is segmentation? What are the basis on which consumer markets are being segmented? 10
   b) What are competitive strategies for market leaders. Differentiate between proactive and defensive marketing. 10

Q.6 a) What is pricing? List out the factors on which the price of a particular commodity is fixed. 8
   b) Explain the following terms in brief:
      i) Product levels
      ii) Product classifications
      iii) Product hierarchy
      iv) Product line analysis. 3x4

Q.7 a) Explain in detail the communication process models. 10
   b) What is corporate social responsibility and social marketing? 10
End Semester Examination, May 2014
B. Tech. – Eighth Semester
HUMAN RESOURCE MANAGEMENT (HM-822)

Time: 3 hrs Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer the following:
  a) Essential skills of an HR manager.
  b) Role of organizations in career planning of employees.
  c) What is induction training?
  d) Importance of internal placement.
  e) How is an in-company training programme evaluated?
  f) What are the major benefits of performance appraisal?
  g) Role of HR in knowledge industry.
  h) What is meant by HR audit?
  i) Key components of manpower forecasting.
  j) What is succession planning? 2x10

**PART-A**

Q.2 Explain the importance of HRM in the emerging economic/business scenario. How has HRM emerged as the important management function? 20

Q.3 What is meant by HR planning? Why is HR planning more common among large business organization? 20

Q.4 What is recruitment process? What are the major recruitment challenges faced by a modern IT organization? 20

**PART-B**

Q.5 Explain the philosophy of training and the importance of training of employees in modern business organizations. 20

Q.6 What is meant by performance appraisal process? Explain by suitable examples. 20

Q.7 Briefly explain the relevance and importance of knowledge management in modern business organizations. 20
End Semester Examination, May 2014
B. Tech. – Eighth Semester
PROJECT MANAGEMENT (HM-823)

Time: 3 hrs  Max Marks: 100
Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) Explain life cycle.
     b) Backward integration project.
     c) Project planning.
     d) Project control.
     e) Product mix.
     f) Types of project appraised.
     g) Post project reviews.
     h) Type of contract.
     i) Project evaluation methods.
     j) Material requirement planning (MRP).

Q.2  a) Explain various factors to be considered for identification of the project.
     b) What are the attributes required for a good project manager?

Q.3  a) Explain the procedure for formulation of a project.
     b) Explain the points which are involved in technical appraisal of a project.

Q.4

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a) Draw a PERT diagram.
   b) Calculate total project duration.
   c) Mark critical path.
   d) Find the probability that the project will be completed in 50-days.

Q.5  a) Explain the process of project scheduling.
     b) In what way management information supports the project and decision making?

Q.6  a) Explain the pure project organizational structure with a diagram.
     b) Explain the types of work breakdown structure.

Q.7  a) Explain the causes due to which projects are terminated.
     b) Explain the inventory management techniques which economize the project cost.

PART-A: 2x10
PART-B: 5 5 4 6
End Semester Examination, May 2014
B. Tech. – Eighth Semester
MULTIMEDIA AND ANIMATION (IT-301)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt **FIVE** questions in all; **Q.1 is compulsory.** Attempt any **TWO** questions from **Part A** and **TWO** questions from **Part B.** Each question carries equal marks.

**Q.1**

a) List the problem of a multimedia information system.
b) What are the design approaches to multimedia authoring?
c) List atleast four requirements of a good user interface.
d) What are the applications of ADSL to multimedia?
e) Explain the TAG IDS that TIFF tags may have.
f) Explain various desktop virtual reality tools.
g) State the merits of sub-band coding.
h) What is hidden Markov model? Explain it in brief.
i) Define anti-aliasing. What is the use of an anti-aliasing filter?
j) Define the terms: tweening and frames. 2x10

**PART-A**

**Q.2**

a) List and explain the drawbacks of CD-Audio and CD-ROM that are overcome by CD-I. 4
b) What do you mean by an authoring system? Write short notes on types of authoring tools used. 6
c) What is ATM? Explain the working of its layers. What are the problems that were faced by existing system and how are they solved? 10

**Q.3**

a) What are the differences between bitmaps and vector graphics? Which one is better? 5
b) Explain the working of a TIFF file format. 5
c) What are objectives of JPEG? Explain the basic architecture and working of JPEG with help of a neat diagram. 10

**Q.4**

a) Explain VEOS system architecture with help of a neat diagram. 5
b) What do you mean by intelligent multimedia system? Explain its working. 7
c) What is the role of multimedia technology in today's business, entertainment and education field? Explain in detail. 8

**PART-B**

**Q.5**

a) Explain the process of sampling and quantization in process of sound conversion. 5
b) What do you mean by digital sound and time domain sampled representation? List the problems faced during digital sound transmission. 7
c) What is speech recognition? What are various parameters by which it is categorized? List the problems and components associated with it with help of a diagram. 8

**Q.6**

a) Write a short note on DVI technology. 5
b) What is the basic principle of time-based media representation? What are various levels dealt by time-based media? 7
c) How motion estimation and compression are achieved in MPEG? What are the various levels of bit stream syntax? Explain in detail with help of a diagram. 8

**Q.7**

a) State the problems that occur in anti-aliasing filter and how are they solved? Also explain the types of anti-aliasing. 10
b) Write short notes on:
   i) Macromedia Flash ii) Acrobat photo shop 5x2
End Semester Examination, May 2014
B. Tech. – Eighth Semester
MANAGEMENT INFORMATION SYSTEMS (IT-721)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Differentiate between data and data warehouse.
   b) What are the various issues of a management information system?
   c) Describe the planning phase of MIS.
   d) What is the role of MIS in organization?
   e) What are the needs of automation of MIS?
   f) How testing of MIS is done?
   g) Which services are provided by MIS in service sector?
   h) What are functional controls in MIS?
   i) What is Decision Support System?
   j) What is the importance of MIS in production sector? 2x10

PART-A

Q.2 a) What are the roles of data warehouse in management information system? Give an example. 10
   b) Explain all the benefits of MIS for working of an organization. 10

Q.3 a) Which tools and procedures are required for the organization as an MIS system? 10
   b) What are objectives for collection of information and facts for MIS? 10

Q.4 a) Explain the following:
    i) Functional control in MIS.
    ii) Requirement analysis for MIS. 10
   b) How the information is classified and explains the model for which it is to be used for information processing? 10

PART-B

Q.5 a) Discuss the architecture of MIS. Explain each and every module in detail. 10
   b) What is the role of staff training and reporting system in MIS? 10

Q.6 a) What is the importance of having MIS in an organization in service sector? Give an example. 10
   b) What are various tools used for strategic planning during MIS development? 10

Q.7 a) Why do we need security features in MIS? Give an example. 10
   b) Discuss in detail:
      i) MIS for production sector. 5
      ii) Reporting factor for production sector in MIS. 5
End Semester Examination, May 2014
B. Tech. – Eighth Semester
MANAGEMENT INFORMATION SYSTEMS (IT-721)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) What are the components of an information system?
   b) What are the layers that consist information system architecture?
   c) What are purposes of system development?
   d) State the importance to include a model in DSS.
   e) What is transaction processing system?
   f) What is technical feasibility?
   g) Define decision support system.
   h) What do you mean by structured methodologies?
   i) What is a production system?
   j) How information is gathered for system planning?

   2x10

PART-A

Q.2 a) Explain the concept of MIS. Explain emergence and role of MIS in an organization.
   b) We need automated MIS in organization, explain MIS as a system unit in an organization.

   10

Q.3 a) Explain in detail, types of organization where MIS plays a vital role.
   b) Explain functional model of organization and organizational behaviour in relation to organizations using MIS.

   10

Q.4 a) “Information is known as quality product”. Explains.
   b) Write short notes on:
      i) Classification of information.
      ii) Method of data and information collection.
      iii) Model of information processing.

   4x3

PART-B

Q.5 a) Explain architecture of MIS and detailed layout of its component and models.
   b) Explain the steps involved in design, development and implementation of an MIS.

   10

Q.6 a) Explain the concept of decision support systems with regard to DSS models and their working.
   b) What do you understand by strategic management of an organization? Explain strategic planning and its tools used in MIS activities.

   10

Q.7 a) How do you identify work domain of service sector which uses MIS?
   b) Explain in relation to a production system.
      i) Design and development of various models.
      ii) Layout of specification of activities.

   6x2
End Semester Examination, May 2014
B. Tech. – Eighth Semester
SOFTWARE PROJECT MANAGEMENT (IT-821)

Time: 3 hrs
Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
   a) What does software project management mean?  
   b) Differentiate between a project and a product.  
   c) Give significance of cost benefit analysis.  
   d) What is cross functional team?  
   e) What is a defect tracking tool?  
   f) Differentiate between software validation and software verification.  
   g) What are advantages to use spiral model?  
   h) What do you understand by quality standards?  
   i) What are goals of project management?  
   j) What is requirement traceability matrix?

\[2 \times 10\]

PART-A

Q.2  
   a) Define various phases associated in software project management.  
   b) What do you understand by tailored software development process?

\[10\]

Q.3  
   a) Explain RAD model for software development.  
   b) Write a short note on resource planning.

\[10\]

Q.4  
   a) Explain intermediate COCOMO model in detail.  
   b) Explain chief programmer and democratic teams along with their advantages and disadvantages.

\[10\]

PART-B

Q.5  
   a) Write down the factors associate with risk management. How will you prioritize the risks in a software project?  
   b) Write down how configuration management process works.

\[12\]

Q.6  
   a) Explain how to deal with unrealistic schedule demands in a software project.  
   b) Explain a few reasons why many software project fails.

\[10\]

Q.7  
   Write short notes on:  
   a) Code review.  
   b) Walkthrough.  
   c) Inspection.  
   d) Critical change management.

\[5 \times 4\]
End Semester Examination, May 2014
B. Tech. – Eighth Semester
DATA WAREHOUSING AND DATA MINING (IT-822)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 a) Differentiate between fact table and dimension table.
   b) Define virtual data warehouses.
   c) Describe the types of concept hierarchy in mining.
   d) Define data transformation.
   e) Differentiate between classification and clustering.
   f) Define text mining.
   g) What is correlation analysis?
   h) Write down the issues of data mining.
   i) Why is outlier mining important?
   j) Write the advantages of OLAP over OLTP. 2x10

PART-A

Q.2 a) List the different operations in OLAP. Explain each one of them with the help of an example. 10
   b) Explain the following terms:
      i) Data marts.
      ii) Fact constellation schema for multidimensional database. 5x2

Q.3 a) Give types of OLAP servers and differentiate between them. 10
   b) Explain 3-tier DWH architecture with a neat sketch. 10

Q.4 a) Write short notes on:
      i) Discovery driven cube.
      ii) Multi-feature cube 5x2
   b) The following data for the attribute age:
      Use smoothing by bin means to smooth these data, use a bin depth of 3. Illustrate your steps. Comment on the effect of this technique for the given data. 10

PART-B

Q.5 a) List the primitives that specify a data mining task. 10
   b) Write short notes on:
      i) Architecture of data mining system.
      ii) KDD vs Data mining. 5x2

Q.6 a) A database has five transactions. Let min sup=60% and min-conf = 80%.

<table>
<thead>
<tr>
<th>TID</th>
<th>Items Bought</th>
</tr>
</thead>
<tbody>
<tr>
<td>T100</td>
<td>{M,O,N,K,E,Y}</td>
</tr>
<tr>
<td>T200</td>
<td>{D,O,N,K,E,Y}</td>
</tr>
<tr>
<td>T300</td>
<td>{M,A,K,E}</td>
</tr>
<tr>
<td>T400</td>
<td>{M,U,C,K,Y}</td>
</tr>
<tr>
<td>T500</td>
<td>{C,O,O,K,I,E}</td>
</tr>
</tbody>
</table>

Find all frequent item sets using Apriori Algorithm. 10
   b) Explain the following:
      i) K-means algorithm. 5x2
      ii) Decision tree induction.

Q.7 Write short notes on:
   a) Mining sequence data. 7
   b) Mining graphs and network. 6
   c) Mining multimedia databases. 7
End Semester Examination, May 2014
B. Tech. – Eighth Semester
REFRIGERATION AND AIR-CONDITIONING (M-821)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1 Answer in brief:
   a) Explain the term 'tonne of refrigeration'.
   b) Write the chemical formulae for R-12 and R-134a.
   c) What is the difference between a refrigerator and a heat pump?
   d) Discuss the frosting and defrosting evaporators.
   e) Define sensible heat factor.

4x5

Q.2 a) Prove the performance factor of a Bell-Coleman cycle refrigeration system is given by $C.O.P. = \frac{T_1}{T_2 - T_1}$. Where $T_1$ and $T_2$ are temperatures of air at inlet and discharge of compressor respectively.

   b) The capacity of a refrigerator is 600 tons when working on Carnot cycle between $-5^\circ C$ to $+20^\circ C$. Find the mass of ice produced within 24 hours when water is supplied at $10^\circ C$. Also find the minimum kW required. Latent heat of ice = 336 kJ/kg.

10

Q.3 An ammonia refrigerator produces 15 tons of ice from and at $0^\circ C$ in a day. The temperature range of the system is $-15^\circ C$ and $25^\circ C$. The vapour leaving the compressors is dry-saturated. Assuming actual C.O.P. 60% of theoretical value, calculate the power required to drive the compressor and mass flow rate in kg/min.

<table>
<thead>
<tr>
<th>Temperature ($^\circ$C)</th>
<th>Specific enthalpy kJ/kg</th>
<th>Specific entropy kJ/kg K</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Liquid</td>
<td>Vapour</td>
</tr>
<tr>
<td>25</td>
<td>380.74</td>
<td>1319.21</td>
</tr>
<tr>
<td>-15</td>
<td>-54.56</td>
<td>1304.99</td>
</tr>
</tbody>
</table>

20

Q.4 a) Mention the function of each fluid in three fluid vapour absorption system with a neat diagram.

b) How will you assign number to the refrigerants methyl chloride ($CH_3Cl$) and tetra-chloroethane ($C_2H_5Cl_4$)?

10

Q.5 a) Draw a neat diagram of an air-conditioning system required in winter season. Explain the working of different components in the circuit.

b) Explain the following terms:
   i) Wet-bulb temperature and Dew point temperature.
   ii) Degree of saturation and relative humidity.

5x2

P. T. O.
Q.6 Room design conditions are 25°C DBT and 50% R.H., when outside air design conditions are 43°C DBT and 27.5°C WBT. The room sensible and latent heat loads are 20 kW and 5 kW, respectively. The 80% return air is mixed 20% fresh air and then passed the cooling coil of 0.15 by pass factor. Determine:

a) Apparatus dew point temperature
b) Air flow rate into the room in m³/s.
c) Flow rate of fresh air and re-circulated air in m³/min.
d) Refrigeration load of the air-conditioning plant. 20

Q.7 a) What is volumetric efficiency of a compressor? Find the expression of the volumetric efficiency in terms of working pressure ratio. 10
b) Explain the working of evaporation condenser with a neat diagram and explain the advantages and disadvantages over others. 10
End Semester Examination, May 2014  
B. Tech. – Eighth Semester  
REFRIGERATION AND AIR-CONDITIONING (M-821)  

Time: 3 hrs  
Max Marks: 100  
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  
(a) Explain the term: “tonne of refrigeration”.  
(b) What do you mean by pass factor?  
(c) Differentiate between refrigeration and air conditioning.  
(d) Name the refrigerant which does not destroy ozone layer.  
(e) What is the purpose of under cooling in vapour compression refrigeration system?  
(f) What are the factors affecting comfort air-conditioning?  
(g) Write a short note on cryogenics.  
(h) State the chemical formula of R-12 and R-22.  
(i) What is the function of flash chamber in refrigeration?  
(j) A carnot refrigerator requires 1.5 kW per ton of refrigeration to maintain a region at -30° C. Find the COP of refrigerator.  

**PART-A**

Q.2 A dense air refrigeration machine operating on Bell-Coleman cycle operates between 3.4 bars and 17 bars. The temperature of air after the cooler is 15° C and after the refrigerator is 6° C. If the refrigeration capacity is 6-tonnes.  
Calculate:  
(a) Temperature after compression and expansion.  
(b) Air-circulation per min.  
(c) Work of compressor and expander.  
(d) Theoretical COP.  
(e) Rate of water circulation required in the cooler in kg/min, if the rise in temperature is limited to 30° C.  

Q.3  
(a) In a vapour absorption refrigeration system work with generator, ambient and evaporator temperature are 360 K, 310 K and 260 K respectively.  
Find:  
(i) COP  
(ii) If the evaporator temperature falls to 250 K, What should be the generator temperature in order to operate the system with same COP?  

(b) Draw a neat compact diagram of Electrolux refrigerator and explain its working principle. What is the important role of hydrogen in this refrigeration system? What are its advantages over absorption type refrigeration system.  

Q.4 A simple air cooled system is used for an aeroplane having a load of 10-tonnes. The atmospheric pressure and temperature are 0.9 bar and 10° C respectively. The pressure increases to 1.013 bar due to ramming. The temperature of the air is reduced to 50° C in the heat exchanger. The pressure in the cabin is 1.01 bar and the temperature of air leaving the cabin is 25° C.  
Determine:  
(a) Power required to take the load of cooling in the cabin.  
(b) COP of the system.  

Assume that all the expansion and compressions are isentropic. The pressure of the compressed air is 3.5 bars.  

P. T. O.
PART-B

Q.5 Write short notes on:
    a) DBT, WBT, dryness fraction.
    b) Types of refrigerant.
    c) Reciprocating compressor and condenser.

Q.6 A restaurant with a capacity of 100 persons is to be air-conditioned with the following condition:
Outside condition : 30°C DBT and 70% RH
Desired inside condition : 23°C and 55% RH
Quantity of air supplied : 0.5 m³/min./person
The desired condition are achieved by cooling, dehumidifying and then heating.
Represent the process on psychrometric chart and make calculation for the following aspects:
    a) Capacity of cooling coil in ton of refrigeration.
    b) Capacity of heating coil.
    c) Amount of water removed by dehumidifier.
    d) By pass factor of the heating coil if its surface temperature is 35°C.

Q.7 a) Moist air with dry bulb temperature of 40°C has a relative humidity of 50%.
    Atmospheric pressure is 1.01 bar. The saturated pressure of vapour at 40°C is
    7.38 kPa and saturation pressure of vapour at 150°C is 4.758 bars.
    Find: i) Specific humidity.
    ii) Moist air as stated above is compressed to 5.05 bars and corresponding
        DBT is 150°C. Then find the relative humidity of compressed air.
    b) Describe any two expansion devices used in a refrigeration system.
End Semester Examination, May 2014
B. Tech. - Eighth Semester
MODERN MACHINING METHODS (M-835)

Time: 3 hrs
Max Marks: 100

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) State the effect of standoff distance (SOD) on the MRR of AJM.
     b) State the function of shock attenuator in WJM.
     c) Name the types of abrasive grains used in USM.
     d) State the main functions of slurry used in USM.
     e) State the principle of photochemical blanking.
     f) State the basic mechanism of EDM.
     g) State the applications of LBM.
     h) What are safety precautions to be taken during plasma arc machining (PAM)?
     i) State the reasons for maintaining vacuum in EBM.
     j) State the basic principle of ECM spark machining.

     2x10

PART-A

Q.2  What are the various types of unconventional machining processes? Classify these on the basis of the type of energy employed. Also state the mechanism of material removal in brief. 20

Q.3  Write short notes on:
     a) Cutting tool design consideration in USM.
     b) Effect of amplitude of vibration, frequency, grain size and abrasive concentration on MRR in USM.
     c) Effect of variables on MRR in AJM.
     d) Applications of water jet machining.

     5x4

Q.4  Write short notes on:
     a) What functions are served by the electrolyte in ECM?
     b) Analyze the dynamics of ECM process with no feed to the tool.
     c) Explain the working life of an electrolyte.
     d) Explain chemical milling and chemical blanking.

     5x4

PART-B

Q.5  a) Derive an expression for the material removal rate of a R-C relaxation circuit used for the EDM power supply. 15
     b) Sketch the effect of the following parameters on MRR during EDM:
        i) Resistance
        ii) Capacitance

     5

Q.6  a) Explain in brief the working principle of plasma arc machining. 10
     b) Describe with sketch a typical laser system for machining process. 10

Q.7  Write short notes on any two:
     a) Rotary ultrasonic machining
     b) Wirecut EDM
     c) Electro-chemical grinding (ECG)
     d) Electro-chemical honing.

     10x2
End Semester Examination, May 2014
B. Tech. – Eighth Semester
POWER MANAGEMENT (EE-825)

Time: 3 hrs  Max Marks: 100
No. of pages: 1

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1  a) How are energy resources classified?
     b) Name the organizations funding power companies in India.
     c) Why switch gears are used in power stations?
     d) What is the need for load forecasting?
     e) What is LCC of a power plant?
     f) ________ is the time covering for long term forecasting.
     g) Define power system planning.
     h) ________ is a part of pattern based forecasting.
     i) Name the problems related with generation planning.
     j) ________ quantitative analysis should be made for optimal generation expansion.

2x10

PART-A

Q.2  a) What are the different functions of grid management?
     b) Explain Safety Regulation Bills of State and Central Power Boards of India.
     10

Q.3  a) Explain the general layout of a power plant.
     b) What are the various cost curves of a power plant?
     10

Q.4  a) Explain Box Jenkin’s method of load forecasting.
     b) Differentiate between explanatory and time series forecasting techniques.
     10

PART-B

Q.5  Explain different methods of long term forecasting.
     20

Q.6  a) Describe pattern based forecasting.
     b) How will you define the accuracy of load forecasting methods?
     10

Q.7  Explain generation and distribution system planning.
     20
End Semester Examination, May 2014
B. Tech. – Eighth Semester
SOLAR ENERGY AND ITS APPLICATIONS (M-626)

Time: 3 hrs

Max Marks: 100
No. of pages: 2

Note: Attempt FIVE questions in all; Q.1 is compulsory. Attempt any TWO questions from Part A and TWO questions from Part B. Each question carries equal marks.

Q.1
a) Describe radiation.
   b) Explain global radiation.
   c) Why solar radiation is treated as monodirectional radiation?
   d) Why the solar constant is not a constant?
   e) How much time Earth takes to move through one degree.
   f) Describe Zenith angle.
   g) Explain thermal inertia.
   h) Describe Reynolds number and its usefulness.
   i) Name the flat plate collector which combines the solar energy collection and sensible thermal (heat) storage.
   j) Ideal value of energy concentration ratio W is _____ and for flat plate solar collectors it lies between ________.

   2x10

PART-A

Q.2
a) What is a spectrum? Explain the difference between extraterrestrial and terrestrial spectrums.
   b) Name the instrument used to measure total (global) radiation. Explain the constructional details and its working with a neat sketch highlighting the limitations.

   8

   12

Q.3
a) Explain in brief:
   i) Hour angle
   ii) Declination angle
   iii) Latitude angle
   iv) Slope
   v) Zenith
   b) Calculate the number of day light hours at Delhi on Dec 21st and June 21st in a leap year. Latitude of Delhi $\phi = 28.5^\circ$.

   2x5

   10

Q.4
a) Explain with a neat diagram the behaviour of the incident radiation when it strikes the flat plate solar collector.
   b) Describe in detail the solar constant.
   c) List the various orientations of the flat plate solar collector and explain which orientation gives the overall best performance.

   5

   5

   10

   10

PART-B

Q.5
a) Classify different types of solar collectors. List the different types of flat plate solar collectors, employing liquid as a heat transfer fluid.
   b) Describe in detail with a neat sketch the constructional features of single window flat plate solar collector and its material requirements.
   c) Describe the advantages and disadvantages for the same.

   5

   10

   5

P. T. O.
Q.6  
a) Explain thermal energy storage and why is it necessary.  
b) List the major characteristics of thermal energy storage.  
c) Describe in detail the sensible heat storage with a neat sketch. Also list the materials used and its applications.  

Q.7  
a) Describe in detail the solar water pumping arrangement with neat schematic diagram and its applications.  
b) Describe in detail the solar gas absorption refrigeration scheme with a neat schematic diagram and its applications. Also list the materials used.