MANAV RACHNA
vidyanatariksha

MANAV RACHNA UNIVERSITY

(FORMERLY MANAV RACHNA COLLEGE OF ENGINEERING
NAAC ACCREDITED 'A' GRADE INSTITUTION)

Declared as State Private University under section 2f of the UGC act, 1956

DEPARTMENT OF MATHEMATICS

"T3 Examination, May 2017-18"

Semester: Second
Subject: Discrete Mathematics
Branch: CST
Course Type: Core
Time: 3 Hours
Max.Marks: 80

Date of Exam: 15 /05/2018
Subject Code: MAH106-T
Session: I
Course Nature: Hard
Program: B.Tech
Signature: HOD/Associate HOD: Amitoostha

Note: All questions are compulsory from part A (2*10 = 20 Marks). Attempt any two questions from Part B (15 Marks each). Attempt any two Questions from Part -C (15 Marks each).

PART -A

Q.1 (a) Define center of a group.

(b) Define ring with unity.

(c) Find the dual of the following Boolean expression $x(\overline{y}\ \overline{z} + y\,z)$.

(d) Give an example of a graph which contains an Eulerian circuit that is also a Hamiltonian cycle.

(e) Define size and order of a graph.

(f) Define regular graph with an example.

(g) Give the definition of cut edge of bridge of a graph.

(h) Is there a simple graph corresponding to the degree sequence (1, 1, 2, 3).

(i) How many vertices and edge do the graphs k_n *and* $k_{m,n}$ have?

(j) Define Isolated and pendant vertex.

PART - B

Q.2 Q.1 (a) Define a group with an example. State the axioms which a set must obey so that it may form an abelian group. Show that the set $G = \{a + b\sqrt{2}: a, b \in Q\}$ is an abelian group with respect to addition. (8)

(b) Define subgroup. Lat H be a non-empty subset of a group G, then prove that it is a sub group of G if and only if $a * b^{-1} \in H \quad \forall a,\ b \in H$. (7)

Q.3 (a) Simplify $Y = (P + Q)(P + \bar{Q})(\bar{P} + Q)$ using algebra method. (5)

(b) Prove that $a + (a.b) = a$. (3)

(c) Define ring with zero divisor. Suppose M is a ring of all 2×2 matrices with their elements as integer, the addition and multiplication of matrices being the two ring compositions. Then show that M is a ring with zero divisor. (7)

Q.4 (a) Define Boolean algebra. Write down the axioms of Boolean algebra. Simplify (8)

$$Y = \sum m(0, 1, 4,\ 5,\ 6,\ 8,\ 9,\ 12,\ 13\,, 14)$$ (7)

(b)State and prove De' Morgan's Law in Boolean algebra.

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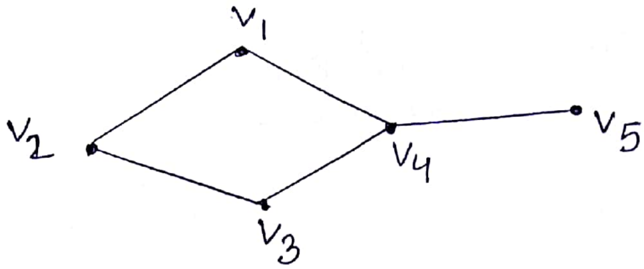
PART -C

Q.5 (i) Define subgraph of a graph. Construct two edge deleted subgraph and two vertex deleted subgraphs of a graph shown below. (5)



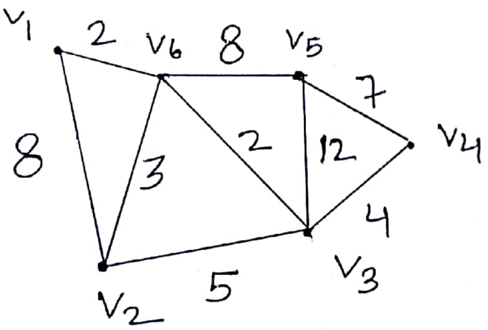
(ii) Define planar graph. Show that k_5 is non-planar. (5)

(iii) Define degree of an undirected graph. A graph G has 21 edges, 3 vertices of degree 4 and other vertices are of degree 3. Find the number of vertices in G. (5)

Q.6 (i) Consider a tree T with 3 vertices of degree 2, 4 vertices of degree 3 and 3 vertices of degree 4. Calculate the number of pendant vertices in a tree be *m*. (4)

(ii) Prove that there is one and only one path between every pair of vertices in a tree T. (4)

(iii) Define minimal spanning tree. Describe Prim's algorithm and use this to find out the minimal spanning tree of the following graph. (7)

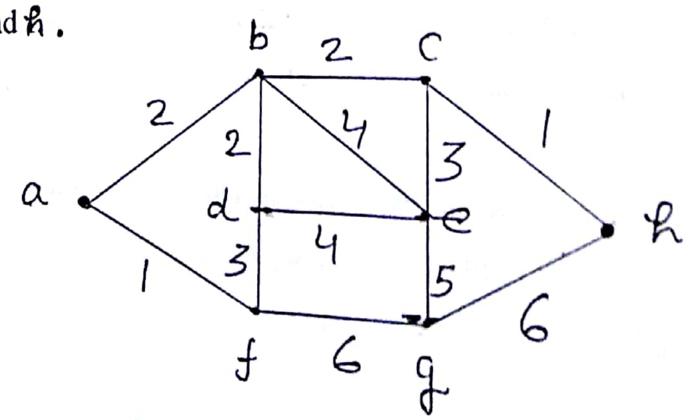


Q.7. (i) Define Eulerian Graph. Answer and justify

(a) which complete bipartite graphs are Eulerian?

(b) for what value of n is the graph of k_n Eulerian? (5)

(ii) Apply Dijkstra's algorithm to the graph given below and find the shortest path between a and h. (10)



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