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-2018"

Semester: II
Subject: Operation Research
Branch: M.Sc (Maths)
Course Type: Core
Time: 3 Hours
Max.Marks: 100

Date of Exam:17/5/2018.
Subject Code: MAH505
Session: I
Course Nature: Hard
Program: M.Sc
Signature: HOD/Associate HOD:

Note: Attempt any two question from Part (A), Part (B) & Part (C) .

Part A

Q1.(a) Prove that the intersection of any finite number of convex sets is also a Convex Set. (4)

(b).State and prove the fundamental theorem of Linear Programming. (6)

Q2. Solve the following problem by Penalty Method:

Min $z = x_1-3x_2+2x_3$

Subject to constraints:

$3x_1-x_2+3x_3<=7$

$-2x_1+4x_2<=12$

$-4x_1+3x_2+8x_3<=10$, and $x_1,x_2,x_3>=0$ (10)

Q3 Prove that any point on the line segment joining two points in R^n can be expressed as a convex combination of two points. Examine the converse for validity. (10)

PART B

Q4.(a) What is unbalanced transportation problem? How do you start in this case ? (5)

(b) Find the starting solution in the following transportation problem by 'North-West-Corner 'Rule .Also obtain the optimum solution. (15)

	W_1	W_2	W_3	W_4	W_5	Available
A	4	3	1	2	6	40
B	5	2	3	4	5	30
C	3	5	6	3	2	20
D	2	4	4	5	3	10
Required	30	30	15	20	5	

Q5.

(a) A manufacturing company has four Zones A,B,C,D and four sales engineers P,Q,R,S respectively for assignment. Since the zones are not equally rich in sales potential, it is estimated that a particular engineer operating in a particular zone will bring the following sales:
Zone A: 4,20,000, Zone B: 3,36,000, Zone C: 2,94,000, Zone D: 4,62,000

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The engineers are having different sales ability. Working under the same conditions their yearly sales are proportional to 14,9,11 and 8 respectively. The criteria of maximum expected total sales is to be met by assigning the best engineer to the richest zone, the next best to the second richest zone and so on. Find the optimum assignment and maximum sales. (15)

(b).Give the mathematical formulation of an assignment problem. (5)

Q6(a) A steel company has three open hearth furnaces and five rolling mills. Transportation cost (rupees per quintal) for shipping steel from furnaces to rolling mills are shown in the following table: (10)

	M_1	M_2	M_3	M_4	M_5	Capacities
A	4	2	3	2	6	8
B	5	4	5	2	1	12
C	6	5	4	7	3	14
Required	4	4	6	8	8	

Q5(b). Explain clearly the salesman problem and discuss the method of solve it. (10)

PART C

Q7(a). The payoff matrix of a game is given. Find the solution of the game to the player A and B. (3)

		PLAYER B				
		I	II	III	IV	V
PLAYER A	I	-2	0	0	5	3
	II	3	2	1	2	2
	III	-4	-3	0	-2	6
	IV	5	3	-4	2	-6

(b) For the game with the following payoff matrix, determine the optimum strategies and the value of the game: (7)

	P_2	
P_1	5	1
	3	4

(c). Consider a "modified" form of " matching biased coins" game problem. The matching player is paid Rs. 8.00 if the two coins turn both heads and Re. 1.00 if the coins turn both tails. The non-matching player is paid Rs.3.00 when the two coins do not match. Given the choice of being the matching or non-matching player, which one would you choose and what would be your strategy? (10)

Q8(a) State the fundamental theorem of rectangular games. (2)

(b) Explain the following terms:

(i) Two-person zero-game (ii) Pure strategy in game theory. (3)

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(c)Use the relation of dominance to solve the rectangular game whose payoff matrix to A is given in Table : (15)

	B						
A		I	II	III	VI	V	VI
	I	0	0	0	0	0	0
	II	4	2	0	2	1	1
	III	4	3	1	3	2	2
	VI	4	3	7	-5	1	2
	V	4	3	4	-1	2	2
	VI	4	3	3	-2	2	2

Q9.

(a) Two players A and B without showing each other, put on a table a coin, with head or tail up. A wins Rs. 8 when both the coins show head and Rs1 when both are tails wins Rs3 when the coins do not match .Give the choice of being matching player a or non-matching player B , which one would you choose and what would be your strategy? (15)

(b) How is the concept of dominance used in simplifying the solution of a rectangular game ?(5)

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