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Total No. of Questions : 08] [Total No. of Pages :02

Paper ID [IE501]

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M.Tech. (Sem. - 1st)

QUANTITATIVE METHODS & OPERATIONS RESEARCH (IE - 501)

Time : 03 Hours **Maximum Marks : 100**

Instruction to Candidates:

1) Attempt any **Five** questions.
2) **All** questions carry equal marks.

Q1) (a) Discuss various phases in solving an OR problem.
(b) Explain the role of operation research in decision making.

Q2) (a) Use two-phase simplex method to :

Maximize: $z = 3x_1 + 2x_2 + 2x_3$

Subject to the constraints $5x_1 + 7x_2 + 4x_3 \leq 7$

$-4x_1 + 7x_2 + 5x_3 \geq -2$

$3x_1 + 4x_2 - 6x_3 \geq 29/7$

(b) What do degeneracy mean in 'Simplex Method'.

Q3) Determine an initial basic feasible solution to the following T.P using
(a) North-west corner rule.
(b) Vogel's approximation method

Destination

		1	2	3	4	5	
Origin	A	2	11	10	3	7	4
	B	1	4	7	2	1	8
	C	3	9	4	8	12	9
Demand	3	3	4	5	6		

Q4) (a) Distinguish between transportation model and assignment model.
(b) Find the minimum cost solution for the 5×5 assignment problem whose cost coefficient are as given below:

	1	2	3	4	5
1	-2	-4	-8	-6	-1
2	0	-9	-5	-5	-4
3	-3	-8	-9	-2	-6
4	-4	-3	-1	0	-3
5	-9	-5	-8	-9	-5

Q5) (a) Solve the following LPP by dynamic programming method:

Maximize: $z = 4x_1 + 14x_2$

Subject to the constraints $2x_1 + 7x_2 \leq 21$

$7x_1 + 2x_2 \leq 21$

$x_1, x_2 \geq 0$

(b) List down the advantages, disadvantages of dynamic programming approach.

Q6) (a) Find the best strategies and the value of the following game:

	B		
	-1	-2	8
A	7	5	-1
	6	0	12

(b) Describe the role of 'theory of game' for scientific decision making.

Q7) (a) A mechanic repairs four machines. The mean time between service requirements is 6 hours for each machine and forms an exponential distribution. The mean repair time is 1 hour and also follows the same distribution pattern. Machine down time costs Rs. 30/hr and the maintenance cost Rs. 60/hr.

(i) Find the expected number of operating machines.

(ii) Determine the expected downtime cost/day.

Would it be economical to engage two mechanics, each repairing only two machines?

(b) Describe Brown's algorithm.

Q8) Use dual simplex method to

Minimize: $z = 2x_1 + 2x_2 + 4x_3$

Subject to the constraints $2x_1 + 3x_2 + 5x_3 \geq 2$

$3x_1 + x_2 + 7x_3 \leq 3$

$x_1 + 4x_2 + 6x_3 \leq 5$

$x_1, x_2, x_3 \geq 0$

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