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Sub Code: NME-051

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B.TECH
(SEM-VIII) THEORY EXAMINATION 2017-18
OPERATIONS RESEARCH

Time: 3 Hours

Total Marks: 100

- Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.
 2. Any special paper specific instruction.

SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

- a. Explain basic feasible solution of LPP.
- b. What is the condition for degeneracy in LPP?
- c. What do you mean by unbalanced transportation problem?
- d. Define saddle point in game theory.
- e. The monthly demand of the product is 200 units, the holding cost is 2% of the unit cost, the ordering cost is Rs. 1000 and the unit cost of product is Rs 100. Find EOQ.
- f. Explain multi channel queuing models.
- g. Write some applications of network techniques.
- h. Explain an unbalanced assignment problem.
- i. Explain pure strategy in game theory.
- j. Write the parameters on which EOQ depends.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

- a. Solve by simplex method:
 Maximise: $z = 2x + 5y$
 Subjected to: $x + 4y \leq 24$, $x + y \leq 9$, $3x + y \leq 21$
 $x, y \geq 0$
- b. There are five jobs to be assigned one each to five machines and the associated cost matrix is given below. Assign the jobs and find out minimum cost.

	I	II	III	IV	V
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	25	12	16
D	21	24	17	28	26
E	14	10	12	11	15

- c. A machine operator has to perform two operations, turning and threading, on a number of different jobs. The time required to perform these operations (in minutes) for each job is known. Determine the order in which the jobs should be processed in order to minimize the total time required to turn out all the jobs.

Job	Time for turning	Time for threading
1	3	8
2	12	10
3	5	9
4	2	
5	9	3
6	11	1

- d. Why items are stocked in inventory? Explain different types of costs associated with inventory system.

- e. Explain the following terms:
 (i) Queue discipline (ii) Jockeying (iii) Traffic intensity (iv) Balking (v) Reneging.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

- (a) What do you understand from sensitivity analysis in LPP? What is the advantage of carrying out sensitivity analysis? Give examples.
 (b) Solve the following problem by using graphical method or otherwise
 Minimize $Z = 3x_1 + 2x_2$
 Subjected to $8x_1 + x_2 \geq 8$, $2x_1 + x_2 \geq 6$, $x_1 + 3x_2 \geq 6$, $x_1 + 6x_2 \geq 8$, $x_1, x_2 \geq 0$

4. Attempt any *one* part of the following: 10 x 1 = 10

- (a) What are the methods to optimize a transportation problem? Explain any one of them.
 (b) Goods have to be transported from the source S_1, S_2, S_3 to destinations D_1, D_2, D_3 . The transportation cost per unit, capacities of the sources and requirements of the destinations are given in the following table.

	D ₁	D ₂	D ₃	Supply
S ₁	8	5	6	120
S ₂	15	10	12	80
S ₃	3	9	10	80
Demand	150	80	50	

Determine the transportation schedule so that the cost is minimized.

5. Attempt any *one* part of the following: 10 x 1 = 10

- (a) Define the following:
 (i) Pure strategy (ii) Mixed strategy (iii) Saddle point (iv) Payoff matrix
 (v) Two-person Zero-sum game
 (b) Reduce the following game by Dominance method and then find out optimal strategies for both of the players.

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

6. Attempt any *one* part of the following: 10 x 1 = 10

- (a) What do you understand by simulation? Explain Monte-Carlo simulation using an example.
 (b) The demand of a particular product is continuous and shows the following distribution.

Demand	0	1	2	3	4	5	6	7 or more
Probability	0.02	0.05	0.30	0.27	0.20	0.10	0.06	0.00

Find out the optimum stock level if the cost of shortage is Rs 110 per unit and cost of holding is Rs 5 per unit. The shortage cost is proportional to both time and quantity short.

7. Attempt any *one* part of the following:**10 x 1 = 10**

- (a) Distinguish between CPM and PERT. Also explain free float and independent float.
- (b) The customer arrives at a reception counter at an average inter arrival rate of 2 minutes. The receptionist in duty takes an average of one minute per customer.
 - (i) What is the chance that a customer will straight way meet the receptionist?
 - (ii) What is the average queue length?
 - (iii) What is the average no. of customers in the system?
 - (iv) What is the average waiting time of customers in the queue?
 - (v) Suppose management wants to keep a second receptionist when the average waiting time of an arrival exceeds 1.5 minutes. Find what should be the average inter-arrival time to justify a second receptionist?