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Paper Id: | 1 | 4 | 0 | 8 | 0 | 1 | **Roll No.**

B.TECH
(SEM VIII) THEORY EXAMINATION 2017-18
Operations Research

Time: 3 Hours *Total Marks: 100*

Note: Attempt all Sections. If you require any missing data; then choose suitably.

SECTION A

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

  a. Define a model of OR.

  b. Define slack, artificial and basic variables in LPP.

  c. What is meant by an optimality test in a transportation problem?

  d. What do you mean by unbalanced assignment problem?

  e. What are the rules for drawing the network diagram?

  f. Define mixed strategy and a fair game.

  g. Write down different types of costs on which EOQ depends.

  h. Distinguish between deterministic and stochastic inventory models

  i. Explain multi-channel queuing models.

  j. Explain queueing model M/M/1.

SECTION B

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

  a. Explain the concept of degeneracy in LPP.Solve the following problem by using graphical method Maximize $Z = 5X_1 + 6X_2$
  Subjected to constraints: $4X_1 + 7X_2 \leq 20, 5X_1 + 2X_2 \leq 10$, $6X_1 + 8X_2 \leq 25$,
  $X_1, X_2 \geq 0$

  b. A pharmaceutical company has four branches one each at city A B C and D. A branch manager is to be appointed one at each city out of four candidates P Q R and S. The monthly business depends upon the city and the effectiveness of the branch manager in that city.

	A	B	C	D
P	11	11	9	9
Q	13	16	11	10
R	12	17	13	8
S	16	14	16	12

  Which manager should be appointed at which city so as to get maximum total monthly business?

c. Solve the following game graphically and find out the optimal strategies for both of the players.

		Player B			
		1	2	3	4
Player A	1	**4**	**-2**	**3**	**-1**
	2	**-1**	**2**	**0**	**1**
	3	**-2**	**1**	**-2**	**0**

d. What are the types of inventory? Why they are maintained. Explain the various costs related to inventory.What are the economic parameters of inventory?

e. A certain project is composed of nine activities whose time estimates are as given below:

Activity	Duration		Activity	Duration
1-2	1		4-6	2
1-3	3		5-6	4
1-4	2		6-7	6
2-5	1		5-7	3
3-5	3		XX	XX

Draw the project network and find out the critical path.

SECTION C

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

(a) Solve the following problem by using simplex method
Maximize $Z = 5X_1 + 3X_2 + 7X_3$
Subject to $X_1 + X_2 + 2X_3 \leq 22, 3X_1 + 2X_2 + X_3 \leq 26, X_1 + X_2 + X_3 \leq 18, X_1, X_2, X_3 \geq 0$

(b) What is sensitivity analysis? Explain the Big-M method for solving a LPP.

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

(a)Determine the initial feasible solution of the given transportation problem using

VAM. Also find the optimal solution.

	1	2	3	4	Capacity
1	7	10	14	8	30
2	7	12	12	6	40
3	5	8	15	9	50
Demand	20	20	25	30	

(b) What is dynamic programming? Give an illustrative example. What kind of problem can be solved by this? Also list the advantages and disadvantages of dynamic programming.

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

(a)The operation time of two jobs 1 and 2 on 5 machines is given in the following table. Find out the optimum sequence in which the jobs should be processed so that the total time used is minimum.

Job 1	M1	M2	M3	M4	M5
	1	2	3	5	1
Job 2	M3	M1	M4	M5	M2
	3	4	2	1	5

(b)For what type of business problem might game theory be useful? Explain. Solve the following game

		Player B	
		1	2
	1	2	6
Player A	2	4	5
	3	12	4

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

(a)What do you understand by Simulation? Explain the Monte Carlo method of simulation. Also discuss its advantages and disadvantages.

(b)The probability distribution of monthly sales of a certain item is as follows:

Monthly sales, D	0	1	2	3	4	5	6
Probability	0.02	0.05	0.30	0.27	0.20	0.10	0.06

The cost of carrying inventory is Rs.10 per unit per month. The current policy is to maintain a stock of four items at the beginning of each month. Assuming that the cost of shortage is proportional to both time and quantity short, obtain the imputed cost of shortage of one item for one time unit.

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

(a) The arrival rate of customers at a banking counter follows Poisson distribution with a mean of 45 per hour. The service rate of the counter clerk also follows Poisson distribution with a mean of 60 per hour.
- a) What is the probability of having 0,5,10 customers in the system?
- b) Find average number of units in the system.
- c) Find average number of units in the queue.
- d) Find average waiting time in the system.
- e) Find average waiting time in the queue.

(b)What do you mean by network analysis? What is its significance? Also distinguish between the following:

    i. CPM and PERT
    ii. Critical and Dummy activities