

BTECH
(SEM VII) THEORY EXAMINATION 2018-19
OPERATIONS RESEARCH

Time: 3 Hours

Total Marks: 100

Notes: Assume any Missing Data.

SECTION - A

1. Attempt all questions in brief.

2 x 10 = 20

- a. What is the role of operations research in decision making?
- b. "Dual of a dual is it's primal." Explain.
- c. Degeneracy in a transportation problem.
- d. What are assignment problems? Give two examples.
- e. What is float? What are the different types of float?
- f. What is looping and dangling in network diagram?
- g. What is two person zero-sum games?
- h. Characteristics of M/M/1 queue model.
- i. Discuss the various costs involved in an inventory model.
- j. Write a lucid note on replacement problem.

SECTION - B

2. Attempt any three of the following:

10 x 3 = 30

- a. Three machine shops A, B, C produces three types of products X, Y, Z respectively. Each product involves operation of each of the machine shops. The time required for each operation on various products is given as follows:

Products	Machine Shops			Profit per unit
	A	B	C	
X	10	7	2	\$12
Y	2	3	4	\$3
Z	1	2	1	\$1
Available Hours	100	77	80	

The available hours at the machine shops A, B, C are 100, 77, and 80 only. The profit per unit of products X, Y, and Z is \$12, \$3, and \$1 respectively.

- b. Find the optimal solution of the following transportation problem in which cell entries represent unit costs.

Ware House	Market			
	I	II	III	Supply
A	4	14	8	10
B	6	6	2	16
C	10	8	14	14
D	2	12	4	28
Requirement	14	18	36	68

- c. The following table shows the various jobs of a network along with their time estimates:

Activity	Estimated Duration work		
	Optimistic	Most Likely	Pessimistic
1-2	1	1	7
1-3	1	4	7
2-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15
6-7	2	4	8

Draw a network diagram and determine the critical path. What is the minimum time for completion of projects?

- d. What do you understand by queuing model? Why do arrivals and services follow the Poisson and Exponential distribution respectively?
- e. The demand for an inventory item each costing Re5, is 20000 units per year. The ordering cost is Rs.10. The inventory carrying cost is 30% based on the average inventory per year. Stock out cost is Rs.5 per unit of shortage incurred. Find out various parameters.

SECTION - C

3. Attempt any one part of the following:

10 x 1 = 10

- a. Solve the following LPP

$$\text{Maximize } Z = 5X_1 + 10X_2 + 8X_3$$

Subject to the following constraints :

$$3X_1 + 5X_2 + 2X_3 \leq 60$$

$$4X_1 + 4X_2 + 4X_3 \leq 72$$

$$2X_1 + 4X_2 + 5X_3 \leq 100$$

- b. What is sensitivity analysis? Discuss its significance from managerial viewpoint.

Write the dual of the following primal problem:

$$\text{Maximize } Z = -5x_1 + 2x_2$$

$$\text{Subject to : } X_1 - X_2 \geq 2$$

$$2X_1 + 3X_2 \leq 5$$

$$X_1, X_2 \geq 0$$

4. Attempt any one part of the following:

10 x 1 = 10

- a. A wholesale company has three warehouses from which retail customers. The company deals in a single product, the supply of which at each warehouse are

Warehouse No.	Supply units	Customer No.	Demand units
I	20	A	15
II	28	B	19
III	17	C	13
		D	18

Conveniently, total supply at the warehouses is equal to customers. The following table gives the transportation cost per unit shipment from each warehouse to each customer :