Printed pages:3 **Roll No.** | | | | | | | | | | | **Sub Code: NOE-073**

Paper ID: 9 0 8 0

B-TECH
(SEM.III) 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.

SECTION-A

1. Attempt *all* questions in brief. **2x10 = 20**

a) Describe the scope of Operations Research.
b) Describe computational procedure of Graphical method to solve the LPP.
c) Write mathematical model of Transportation problem.
d) What do you mean by maximization of Assignment problem?
e) Explain the terms: Optimistic time, pessimistic time, most likely time.
f) Explain the terms: CPM and PERT
g) What is two person zero sum game.
h) Describe Saddle point and minimax theorem.
i) Define the terms: Lead time and Demand.
j) Write the characteristics of economic lot size formula without shortage.

SECTION - B

2. Attempt any three parts of the following: **$(3 \times 10 = 30)$**

a) Solve the following LPP by Simplex Method:

Minimize Z= 3X + 2Y

Subject to the following constraints:

$5X + Y \geq 10$

$X + Y \geq 6$

$X + 4Y \geq 12$

and $X \geq 0, Y \geq 0$

b) Solve the following assignment problem:

Persons	Jobs			
	I	II	III	IV
A	2	5	3	4
B	1	6	2	5
C	5	2	3	1
D	6	4	2	1

c) A Small project consists of the following jobs whose precedence relationship is given below:

Job	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration (days)	15	15	3	5	8	12	1	14	3	14

(i) Draw an arrow diagram representing the project.
(ii) Find the critical path and total durations.
(iii) Calculate the floats.

d) What do you mean by Pure and Mixed Strategy? For the following two-person-zero-sum game, find the optimal strategies for the two players and the value of the game:

		Player B		
		B1	B2	B3
Player A	A1	5	9	3
	A2	6	-12	-11
	A3	8	16	10

If the saddle point exists, determine it by using the principle of dominance.

e) Find optimum order quantity for a product for which the price-breaks are as follows:

Quantity (units)	Unit cost (Rs.)
Below 1000	10.00
$1000 \leq Q < 5000$	9.80
$Q \geq 5000$	9.50

The annual demand for a product is 64000 units. The ordering cost is Rs. 10 per order. The carrying cost per unit per year is 20%.

SECTION - C

3. Attempt any one part of each of the following: $(\mathbf{10 \times 1 = 10})$

(a) Describe the phases of Operation Research.
(b) Solve the following L.P.P. using Big. M. Method.

Min $Z = x_1 + x_2$
S.T. $2x_1 + x_2 \geq 4$
$X_1 + 7x_2 \geq 7$
$X_1, x_2 \geq 0$

4. Attempt any one part of each of the following: $(\mathbf{10 \times 1 = 10})$

(a) What do you mean by Transportation problem? Discuss VAM for finding initial basic solution.

(b) A marketing manager has 5 salesman and 5 sales districts. Considering the capabilities of the salesman and the nature of districts the marketing manager estimates the sales per month (in hundred rupees) for each salesman in each district would be as follows:

		Districts				
		A	**B**	**C**	**D**	**E**
	1	**32**	**38**	**40**	**28**	**40**
	2	**40**	**24**	**28**	**21**	**36**
Salesman	**3**	**41**	**27**	**33**	**30**	**37**
	4	**22**	**28**	**41**	**36**	**36**
	5	**29**	**33**	**40**	**35**	**39**

Find the assignment of salesman of districts that will result in maximum sales.

5. Attempt any one part of each of the following: $(\mathbf{10 \times 1 = 10})$

(a) Write a short note on following:

(i) CPM and PERT

(ii) Phases of Project Management

(b) The utility data for a network are given below. Determine the total, free, independent and interfacing floats and identify the critical path.

Activity:	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration:	2	8	10	6	3	3	7	5	2	8

6. Attempt any one part of each of the following: $(\mathbf{10 \times 1 = 10})$

(a) Describe the graphical method to solve 2 × n and m × 2 games.

(b) Using law of dominance, find the solution of the game.

	B			
	B_1	B_2	B_3	B_4
A_1	3	2	4	0
AA_2	3	4	2	4
A_3	4	2	4	0
A_4	0	4	0	8

7. Attempt any one part of each of the following: $(\mathbf{10 \times 1 = 10})$

(a) If in EOQ model as we discussed the setup cost instead of being fixed, is equal to C_3 + bq, where b is setup cost per item produced, then prove that there is no change in the optimal order quantity produced due to change in the setup cost.

(b) A Company has demand of 12,000 units/year and it can produce 2000 items/month. The cost of one setup is Rs. 400 and the holding cost/unit/month is Rs. 0.15. Find the optimum lot size and the total cost per year (let cost of 1 unit as Rs. 4). Also find the maximum inventory manufacturing time.