Printed pages: 3 **Roll No.** ☐☐☐☐☐☐☐☐☐☐ **Sub Code: EOE-073**
Paper ID: 9055

B TECH
(SEM. III) THEORY EXAMINATION 2017-18
OPERATION 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. State the opportunities and shortcomings of operations research.
   b. What do you mean by CPM and PERT?
   c. Define Transportation problem and give its Mathematical model.
   d. Define objective function of LPP.
   e. Define Optimistic and Pessimistic Time?
   f. Explain the principle of duality in linear programming?
   g. Write a short note on: Expected value of Perfect information.
   h. Explain the models of operation research.
   i. State Dominance rule.
   j. Define Slack and Surplus variables.

SECTION - B

2. **Attempt any *three* of the following:** **10 x3= 30**

a. State the rules for constructing a project network. Draw a network to the following information.

Obtain the early and late start and completion times, and determine the critical activities:

Activity	1-2	1-3	2-3	2-4	3-4	4-5
Duration (Days)	20	25	10	12	6	10

b. Describe the graphical method to solve 2×n & m×2 games.

c. The cost of machine is Rs. 61000 & its scrap value is Rs. 1000. The maintenance cost found from past experience are as follows: -

Year	1	2	3	4	5	6	7	8
Maintenance Cost	1000	2500	4000	6000	9000	12000	16000	20000

When the machine should be replaced?

d. Describe the initial method VAM to solve transportation problem and also solve the following TP from same method :

	D1	D2	D3	D4	Supply
S1	5	2	4	3	60
S2	6	4	9	5	60
S3	2	3	8	1	90
Demand	50	65	65	30	210

e.   Solve the following L.P.P. by graphical method

$$\text{Min } Z = 20x_1 + 10x_2$$

Subject to $x_1 + 2x_2 \leq 40$

$3x_1 + x_2 \geq 30$

$4x_1 + 3x_2 \geq 60$

$x_1, x_2 \geq 0$

SECTION – C

3.   Attempt any *one* part of the following: **10 x1= 10**

a.   The following table gives the running cost per year and resale prices of certain equipment whose purchase price is Rs. 5000 :

Year	1	2	3	4	5	6	7	8
Running cost (Rs)	1500	1600	1800	2100	2500	2900	3400	4000
Resale value (Rs)	3500	2500	1700	1200	800	500	300	200

In which year is the replacement due?

b.   For given jobs, each of which must go through the machines A, B and C in the order ABC determines the sequence that will minimize the total elapsed time. Also find out idle time for each machine.

Job No.	1	2	3	4	5
Machine A	6	8	7	10	6
Machine B	3	2	5	6	4
Machine C	4	8	6	7	8

4.   Attempt any *one* part of the following: **10x1= 10**

a.   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.

b.   How will you solve the sequencing problem of three machines and n jobs. Illustrate the procedure.

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

a.   What do you mean by Assignment Problem? Give its Mathematical formulation also describe Hungarian method to solve the assignment problem.

b. Solve the following L.P.P. by simplex method

Max $Z = x_1 + x_2 + 3x_3$

Subject to $3x_3 + 2x_2 + x_3 \leq 2$

$2x_1 + x_2 + 2x_3 \leq 2$

$x_1, x_2, x_3 \geq 0$

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

a. Solve the following with the help of dominance rule and also find the value of the game.

	B1	B2	B3
A1	6	-5	6
A2	6	2	0
A3	7	12	8

b. What is a "Queuing Model"? What are its objectives? Giving basic structure, explain (M/M/1) model.

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

a. Find the value of π experimentally by simulation.

b. Define "Decision tree". Describe the procedure to make and use decision tree.