[03 – 4126]

IV/IV B.E. DEGREE EXAMINATION.

First Semester

Mechanical Engineering

OPERATIONS RESEARCH

(Effective from the admitted batch of 2006–2007)

Time : Three hours Maximum : 70 marks

Question No.1 is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

Assume suitable data wherever necessary.

Answer to question No.1 must be at one place.

1. (a) Define feasible solution and basic solution of LPP.

(b) Explain North-West corner rule.

(c) What is duality in LPP? Explain its application.

(d) Distinguish between transportation and assignment problems.

(e) What are the variables in an inventory problems?

(f) Describe the queueing model M | M | 1.

(g) What is critical path in PERT/CPM? Explain its importance.

2. (a) State the limitations of the graphical method of solving a LPP.

(b) Solve the following LPP using simplex method.

Max. $z = x_1 + x_2 + 3x_3$

Subject to $3x_1 + 2x_2 + x_3 \leq 3$

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

$x_1, x_2, x_3 \geq 0$

3. (a) Explain the steps in Hungarian method for solving assignment problem.

(b) Solving the following TP.

Destination

		A	B	C	D	Available
Origin	P	5	4	2	6	20
	Q	8	3	5	7	30
	R	5	9	4	6	50
Required		10	40	20	30	100

4. (a) Find the sequence that minimizes the total elapsed time required to couple the following tasks on the machines in the order 1-2-3. Find its times on the machines.

	Tasks						
Time on	A	B	C	D	E	F	G
Machine 1	3	8	7	4	9	8	7
Machine 2	4	3	2	5	1	4	3
Machine 3	6	7	5	11	5	6	12

(b) Solve the game.

		I	II	III
	I	6	7	2
A	II	6	2	7
	III	6	1	6

5. (a) Discuss briefly about various types of replacement problems.

(b) A machine owner find, from his past records the cost per year of maintaining a machine whose purchase price is Rs. 6,000 are as follows :

Year	1	2	3	4	5	6
Maintain cost (Rs.)	1,000	1,200	1,400	1,800	2,300	2,800
Resale value (Rs.)	3,000	1,500	750	375	200	200

Determine at what age replacement is due.

6. (a) Explain various types of inventories.

(b) The demand for an item is Rs. 12,000 per year and the shortage are allowed. If the unit costs is Rs. 15 and the holding cost is Rs. 20 per year per unit, determine the optimum total yearly cost. The cost of placing order is Rs. 6,000 and the cost of one shortage is Rs. 100 per year.

7. (a) Explain how a 2-person zero sum game can be solved by linear programming.

(b) Solve the game whose pay-off matrix is given by graphical method.

$$\begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \end{array} \begin{array}{c} \begin{array}{cccc} B_1 & B_2 & B_3 & B_4 \end{array} \\ \begin{pmatrix} 4 & -2 & 3 & -1 \\ -1 & 2 & 0 & 1 \\ -2 & 1 & -2 & 0 \end{pmatrix} \end{array}$$

8. The following table shows the jobs of a project with their duration in days. Draw the network and determine the critical path. Also calculate the total float.

Job	1-2	1-4	2-5	3-7	4-6	5-7	5-9
Duration	10	8	8	16	7	7	7
Job	6-7	6-8	8-10	9-10	10-11	11-12	
Duration	8	5	10	15	8	5	