[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

First question is compulsory.

Answer any FOUR from the remaining.

All questions carry equal marks.

Assume suitable missing data where ever necessary.

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

$(7 \times 2 = 14)$

1. (a) What is Operations Research model?

   (b) Mention the assumptions of linear programming.

   (c) Explain any two differences between Assignment and Transportation problems.

   (d) Explain briefly the procedure adopted in assignment algorithm.

(e) What is the meaning of (M/M/1) : ($\infty\infty$/FCFS) model.

(f) Explain Maximin and Minimax principle with respect to game theory.

(g) Mention two differences between CPM and PERT.

2. (a) Discuss three Operations Research models. (4)

(b) Company manufactures two products. X and Y by using three machines A, B and C. Machine A has 4 hours of capacity available during the coming week. Similarly, the available capacity of machines B and C during the coming week is 24 hours and 35 hours respectively. One unit of product X requires one hour of machine A, 3 hours of machine B and 10 hours of machine C. Similarly one unit of product Y requires 1 hour, 8 hours and 7 hours of machine A, B and C respectively. When one unit of X is sold in the market, it yields a profit of Rs. 5/- per product and that of Y is Ps. 7/- per unit. Solve the problem by using graphical method to find the optimal product mix. (10)

3. A company has three factories X, Y and Z and four warehouses A, B, C and D. It is required to schedule factory production and shipments from factories to warehouses in such a manner so as to minimize total cost of shipment and production. Unit variable manufacturing costs (UVMC) and factory capacities and warehouse requirements are given as:

From Factories	UVMC Rs.	To warehouse Unit shipping costs in Rs.				Capacity in units per month
		A	B	C	D	
X	10	0	1	1	2	75
Y	11	1	2	3	5	32
Z	12	4	3	3	6	67
Requirement		65	24	16	15	

Find the optimal production and transportation schedule. (14)

4. In a maintenance shop mechanics has to reassemble the machine parts after yearly maintenance in the order PQRST on four machines A, B, C and D. The time required to assemble in hours is given in the matrix below. Find the optimal sequence. (14)

Machine	Parts (Time in hours to assemble)				
	P	Q	R	S	T
A	7	5	2	3	9
B	6	6	4	5	10
C	5	4	5	6	8
D	8	3	3	2	6

5. A manufacturer is offered two machine A and B. A has the cost price of Rs. 2,500/- its running cost is Rs. 400 for each of the first 5 years and increase by Rs. 100/- every subsequent year. Machine B having the same capacity as A and costs Rs. 1,250/-, has running cost of Rs. 600/- for first 6 years, increasing thereby Rs. 100/- per year. Which machine should be purchased? Scrap.value of both machines is negligible. Money value is 10% per year. (14)

6. (a) Explain the various costs associated with inventory with examples. (5)

(b) ABC manufacturing company purchase 9,000 parts of a machine for its annual requirement, ordering one month's usage at a time. Each part costs Rs. 20/-. The ordering cost per order is Rs. 15/- and the inventory carrying charges are 15% of the average inventory per year. You have been asked to suggest a more economical purchasing policy for the company. What advice would you offer and how much would it save the company per year. (9)

7. (a) Explain with suitable examples about Poisson arrival pattern and exponential service pattern. (5)

(b) Solve the game whose payoff matrix is (9)

Player A	Player B			
		I	II	III
	I	1	7	2
	II	6	2	7
	III	5	1	6

8. A company manufacturing plant and equipment for chemical processing is in the process of quoting tender called by public sector undertaking. Help the manager to find the project completion time to participate in the tender. (14)

S.No.	Activities	Predecessor	Days
1	A	–	3
2	B	–	4
3	C	A	5
4	D	A	6

S.No.	Activities	Predecessor	Days
5	E	C	7
6	F	D	8
7	G	B	9
8	H	E, F, G	3

(a) Write the network referring to the data

(b) Identify the critical path

(c) Calculate the slack of each event.