Code: ME6T3

III B.Tech - II Semester – Regular Examinations – April 2016

OPERATIONS RESEARCH
(MECHANICAL ENGINEERING)

Duration: 3 hours   Max. Marks: 70

Answer any FIVE questions.   All questions carry equal marks

1. Using simplex method, solve the following Linear Programming problem.   14 M

   Max. $Z = 3 x_1 + 5x_2 + 4 x_3$
   Subject to:
   $$2 X_1 + 3 X_2 \leq 8$$
   $$2 X_2 + 5 X_3 \leq 10$$
   $$3 X_1 + 2 X_2 + 4 X_3 \leq 15$$
   $$X_1, X_2, X_3 \geq 0$$

2. Suresh Iron and Steel Company have 3 open heat furnaces and 5 rolling mills. Transportation cost for transporting steel from furnaces to rolling mills is shown in the table below. Find the optimum schedule so that transportation cost shall be minimum.   14 M

		Rolling Mills					
		M1	M2	M3	M4	M5	Capacity
	F1	4	2	3	2	6	8
Furnaces	F2	5	4	5	2	1	12
	F3	6	5	4	7	3	14
Requirements		4	4	6	8	8	

3. The following mortality table have been observed for a certain type of light bulbs.

End of week	1	2	3	4	5	6
Probability of failure due to date	0.09	0.25	0.49	0.85	0.97	1.00

There are a large number of such bulbs, which are kept in working order. If a bulb fails in service it costs Rs.3/- to replace but if all bulbs are replaced in the same operation it can be done for only Rs. 0.70 a bulb. It is proposed to replace all bulbs at fixed intervals, whether or not they have burnt out and to continue replacing burnt out bulbs as they fail.   14 M

a. What is the best interval between group replacements?

b. At what group replacement price per bulb, would a policy of strictly individual replacement become preferable to the adopted policy?

4. Solve the given payoff matrix by Graphical Method and state optimal strategies of players A and B.   14 M

$$
\begin{array}{c}
 & & & \mathbf{B} \\
 & & \text{I} \quad \text{II} \quad \text{III} \quad \text{IV} \quad \text{V} \\
\text{A} \quad \begin{array}{c} \text{I} \\ \text{II} \end{array} &
\left[\begin{array}{ccccc}
-5 & 5 & 0 & -1 & 8 \\
8 & -4 & -1 & 6 & -5
\end{array} \right]
\end{array}
$$

5.

a. Write a short note on solution methods of integer programming. 7 M

b. Solve the integer programming problem. 7 M

Minimize : $Z = -2X_1 - 3X_2$

Subjected to : $2X_1 + 2X_2 \le 7$

$X_1 \le 2, X_2 \le 2,$

$X_1, X_2 \ge 0,$ are integers

6. A shopkeeper has a uniform demand for an item at a rate of 50 items per month. He buys from a supplier at a rate of Rs. 10 per item and the cost of ordering is Rs.16 for each order. If the Stock holding costs are 20% per year of the stock value, how frequently should he replenish his stock? Suppose the supplier orders a discount of 5% on orders between 200 and 999 items and a 10% discount on order of 1000 items, can the shop keeper take advantage of the discounts. 14 M

7. Barber A takes 15 minutes to complete one haircut. Customers arrive at a shop at an average rate of one every 30 minutes. The arrival process is Poisson. Barber B takes 25 minutes to complete one haircut and the customer arrive at an average rate of one every 40 minutes. The arrival process being Poisson during the steady state. 14 M

a. Where would you expect a bigger queue and how big?
b. Where would you require more time (waiting included) to complete a haircut?
c. What is the average number of customers in Saloon A & B?

8. Enumerate the Bellman's principle of optimality. Apply this principle to divide a given quantity c into n parts so as to maximize their product.   14 M