PVP 12

Code: ME6T3

III B.Tech - II Semester – Regular Examinations – May 2015

OPERATIONS RESEARCH
(MECHANICAL ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1. Solve the following LPP. 14 M

   Maximize z= $x_1 + 2x_2 + 3x_3$, subject to the constraints

   $x_1 - x_2 + x_3 \geq 4, x_1 + x_2 + 2x_3 \leq 8, x_1 - x_3 \geq 2, x_1, x_2, x_3 \geq 0.$

2. a) Solve the minimal assignment problem whose effectiveness matrix is 7 M

	X	Y	Z	W
A	2	3	4	5
B	4	5	6	7
C	7	8	9	8
D	3	5	8	4

b) We have five jobs each of which has to go through the machines A and B in the order A, B. Processing times(in hours) are given as,

Job:	1	2	3	4	5
A:	10	2	18	6	20
B:	4	12	14	16	8

Determine a sequence of these jobs that will minimize the total elapsed time T. 7 M

3. A firm is considering replacement of a machine whose cost is Rs.12,200: and the scrap value is Rs. 200.The maintenance costs are found from experience to be as follows:

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced? 14 M

4. Solve the game graphically whose payoff matrix for the player A is given as follows. 14 M

$$\begin{array}{cc} & \begin{array}{cc} \text{Player B} & \\ \text{I} & \text{II} \end{array} \\ \text{Player A} & \begin{array}{c} \text{I} \\ \text{II} \\ \text{III} \\ \text{IV} \end{array} \begin{bmatrix} 2 & 4 \\ 2 & 3 \\ 3 & 2 \\ -2 & 6 \end{bmatrix} \end{array}$$

5. Patients arrive at a clinic according to a Poisson distribution at the rate of 30 patients per hour. The waiting room does not accommodate more than 14 patients. Examination time per patient is exponential with mean rate 20 per hour.
   i) Find the effective arrival rate at the clinic.
   ii) What is the probability that an arriving patient will not wait?
   iii) Find the average number of patients in the clinic.

14 M

6. A Manufacturing company purchases 9,000 parts of a machine for its annual requirements, ordering one month usage at a time. Each part costs Rs.20. The ordering cost per order is Rs. 15, and the 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? 14 M

7. Solve the following LPP by using Dynamic programming.
   Maximize $z = 3x_1 + 5x_2$ subject to the constraints,
   $x_1 \le 4$, $x_2 \le 6$, $3x_1 + 2x_2 \le 18$ and $x_1, x_2 \ge 0$. 14 M

8. Find the optimum integer solution to the following Integer linear programming problem.
   Maximize $z = x_1 + 2x_2$ subject to the constraints,
   $2x_1 \le 11$, $2x_2 \le 7$, $x_1 + x_2 \le 7$ and $x_1, x_2 \ge 0$ and are integers. 14 M