OR

8. a) Write a note on stochastic Models.
   b) Define the following inventory costs:
      i) Item cost ii) Set-up cost
      iii) Holding cost iv) Stock out cost.

9. a) A T.V Mechanic finds that the time spent on his jobs has an exponential distribution with mean 30 minutes, if he repairs sets in the order in which they come in. If the arrival of sets is time each day? How many jobs are ahead of the average set just brought in?
   b) In a railway marshalling yard , goods trains arrive at the rate of 30 trains per day. Assume that the inter-arrival time follows an exponential distribution and the service time is also to be assumed as exponential with mean of 36 minutes. Calculate
      i) The probability that the yard is empty.
      ii) The average queue length, assuming that the line capacity of the yard is nine trains.

OR

10. a) Define Model III : (M/M/S) : (∞/FCFS).
    b) For counters are being run on the frontier of a country to check the passports and necessary papers of the tourists. The tourists choose any counter at random. If the arrival at the frontier is Poisson at the rate λ and the service time is exponential with parameter $\lambda/2$. What is the steady state average queue at each counter.

******

Roll No .....

IT - 843

B.E. VIII Semester

Examination, June 2015

Operation Research

(Elective-IV)

Time : Three Hours

Maximum Marks : 70

Note : Answer any five questions. All questions carry equal marks.

1. a) By graphical method to solve the following

$$\text{LPP: Max } Z = 3x_1 + 4x_2$$
$$\text{s.t: } 5x_1 + 4x_2 \le 200$$
$$3x_1 + 5x_2 \le 150$$
$$5x_1 + 4x_2 \ge 100$$
$$x_1, x_2 \ge 0$$

   b) Use simplex method to solve LPP:

$$\text{Min } Z = x - 3y + 2z$$
$$\text{Subject to, } 3x - y + 2z \le 7$$
$$-2x + 4y \le 12$$
$$-4x + 3y + 2z \le 10$$
$$x, y, z \ge 0$$

OR

2. a) Solve by Big M method

$$\text{Maximize } Z = x_1 + 2x_2 + 3x_3 - x_4$$
$$\text{Subject to, } x_1 + 2x_2 + 3x_3 = 15$$
$$2x_1 + x_2 + 5x_3 = 20$$
$$x_1 + 2x_2 + x_3 + x_4 = 10$$

   b) Define Transportation problem with mathematical formulation.

3. a) Use branch and bound technique to

Maximize $Z = 3x_1 + 2x_2$

Subject to, $2x_1 + 2x_2 \le 7$

$x_1 \le 2$

$x_2 \le 2$

Where $x_1, x_2 \ge 0$ and are integers.

b) Find an optimum integer solution to the following LPP:

Max $Z = x_1 + 2x_2$

Subject to the constraints:

$2x_2 \le 7$

$x_1 + x_2 \le 7$

$2x_1 \le 11$

$x_1, x_2 \ge 0$ and

x_1, x_2 are integers.

OR

4. a) Minimize $Z = Y_1^2 + Y_2^2 + Y_3^2$

Subject to, $Y_1 + Y_2 + Y_3 \ge 15$

$Y_1, Y_2, Y_3 \ge 0$

b) A small maintenance project consists of the following jobs, whose precedence relationships are 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 total float for each activity.

iii) Find the critical path and the total project duration.

5. a) A machine owner finds from his past records that the costs per year of maintaining a machine, whose purchase price is ₹ 6,000 are as given below:

Year	1	2	3	4	5	6	7	8
Maintenance Cost	1000	1200	1400	1800	2300	2800	3400	4000
Resale price	3000	1500	750	375	200	200	200	200

Determine at what age a replacement is due.

b) The cost of a new machine is ₹ 5,000. The maintenance cost of the n^{th} year is given by

$Cn = 500 (n - 1)$, $n = 1, 2, ...$

Suppose money is worth 5 percent per year, after how many years, will it be economical to replace the machine?

OR

6. a) Solve the game whose pay - off matrix is given by

(Player A)		B_1	B_2	B_3 (Player B)
	A_1	1	3	1
	A_2	0	−4	−3
	A_3	1	5	−1

b) Solve the following game.

Player B

Player A			
	1	7	2
	6	2	7
	5	1	6

7. a) Define Inventory control with their types.

b) The annual demand of an item is 3,200 units. The unit cost is ₹ 6 and inventory carrying charges are 25 percent per annum. If the cost by one procurement is ₹ 150, determine:

i) EOQ

ii) Number of orders per year

iii) Time between two consecutive orders

iv) The optimal cost.