Duration: 03 Hours **Total Marks: 80**

N.B.: 1. Question no 1 is Compulsory.

2. Attempt any three questions out of 5 questions.

3. Assume suitable data ,if required.

Q1 Attempt any four questions from the followings.

a. Write a note on the group replacement policy. (5x4 = 20)

b. Find the ranges of values of p and q which will render the entry (2, 2) a saddle point for the game .

		Player B		
		B1	B2	B3
	A1	2	4	5
Player A	A2	10	7	q
	A3	4	p	6

c. Write a detailed note on the application of network techniques .

d. Explain in brief the advantages and disadvantages of Monte Carlo methods.

e. Explain various types of FLOATS used in project Scheduling.

Q2. a. Solve by simplex method following L.P. problem : 10

$$\text{Minimize } Z = x_1 - 3x_2 + 3x_3,$$

$$\text{Subject to } 3x_1 - x_2 + 2x_3 \leq 7,$$

$$2x_1 + 4x_2 \geq -12$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10$$

$$x_1, x_2, x_3 \geq 0$$

Q2 b. 10

$$\text{Maximize } Z = 3x_1 - x_2,$$

$$\text{Subject to } 2x_1 + x_2 \leq 2.$$

$$x_1 + 3x_2 \geq 3.$$

$$x_2 \leq 4.$$

$$x_1, x_2, \geq 0$$

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Q3 a. 10

A person repairing radios finds that the time spent on the radio sets has exponential distribution with mean 20 minutes .If the radios are repaired in the order in which they come in and their arrival is approximately Poisson with an average rate of 15 for 8 -hour day,what is the repair man's expected ideal time each day ? How many jobs are ahead of the average set just brought in ?

Q3 b. 10

a. Machine A cost rupees 9000 . Annual operating costs are rupees 200 for the first year, and the increase by rupees 2000 every year .Determine the best age at which to replace the machine .If the optimum replacement policy is followed , what will be the average yearly cost of owning and future cost are not discounted.

b. Machine B costs rupees 10,000 . Annual operating cost are rupees 400 for the fist year and then increase by rupees 800 every year .You have now à machine of type A which is one year old ,should you replace it with B , and if so , when ?

c. Suppose you are just ready to replace machine A with another machine of the same type ,when you hear that machine B will become available in year . What would you do ?

Q4 a. 10

A firm has divided its marketing area into 3 zones .The amount of sales depends upon the number of salesman in each zones .The firm has been collecting the data regarding sales and salesman in each area over a numer of past years .

The information is summarized in table. For the next year firm has only 9 salesman and the problem is to allocate this salesman to three different zones so that the total sales are maximum.

Profits in thousands of rupees

No. of salesman	Zone 1	Zone 2	Zone 3
0	30	35	42
1	45	45	54
2	60	52	60
3	70	64	70
4	79	72	82
5	90	82	95
6	98	93	102
7	105	98	110
8	100	100	110
9	90	100	110

Q4 b. 10

A company manufactures around 200 mopades .Depending upon the availability of raw material and other conditions ,the daily productions has been varying from 196 mopades to 204 mopades , whose probability distribution is as given below .

Production /day	196	197	198	199	200	201	202	203	204
probablity :	0.05	0.09	0.12	0.14	0.2	0.15	0.11	0.08	0.06

The finished mopades are transported in specially designed 3-storeyed lorry that can accommodate only 200 mopades .Using the following 15 random numbers

82 ,89 ,78,24,53,61,18,45,04,23,50,77,27,54 and 10, simulate the process to find out

1) What will be the average number of the mopeds waiting in the factory ?
2) What will be the number of empty spaces in the lorry ?

Q5 a. 10

Reduce the following game by dominance and find the game value .

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

Q5 b. 10

The utility data for a network are given below .Determine total , free , independent and interfering floats and identify the critical path.

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration	2	8	10	6	3	3	7	5	2	8

Q6 a. 10

Find the optimum solution to the following transportation problem in which the cells contain the transportation cost in rupees.

	W1	W2	W3	W4	W5	Available
F1	7	6	4	5	9	40
F2	8	5	6	7	8	30
F3	6	8	9	6	5	20
F4	5	7	7	8	6	10
Required	30	30	15	20	5	100(total)

Q6 b. Solve the following assignment problem. 10

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

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