Code: ME6T3

III B.Tech - II Semester – Regular /Supplementary Examinations March 2018

OPERATIONS RESEARCH
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer *all* the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) List the techniques used in operations research.

b) Define feasible and optimum solutions.

c) Define unbalanced assignment problem and write how it can be balanced with an example.

d) Solve the following TP by using north west corner method

Plant	Ware houses P	Ware houses Q	Ware houses R	Capacity
	Transportation cost (Rs.)			
A	50	80	100	400
B	22	90	40	500
C	70	100	55	300
Demand	400	400	400	

e) Explain the minimax and maximin criteria with an example.

f) List important replacement models.

g) Define queue length, system length and list types of queue disciplines.
h) If the arrival rate and service rates are 1.8 customers/minute and 2 customers/ minute respectively then, calculate the average number of customers in the system and queue and also the average time a customer spends in the queue.
i) List the types of costs involved in inventory problems and define any two of them.
j) List the industrial applications of simulation
k) Define state variable and decision variable.

PART – B

Answer any *THREE* questions. All questions carry equal marks.

3 x 16 = 48 M

2. The manager of an oil refinery must decide on the optimal mix of two possible blending processes of which the input and output per production run are given as follows:

Process	Input		Output	
	Crude A	Crude B	Gasoline X	Gasoline Y
1	5	3	5	8
2	4	5	4	4

The maximum amount available of crudes A and B are 200 units and 150 units respectively. Market requirements show that at least 100 units of gasoline X and 80 units of gasoline Y must be produced. Formulate this problem as a linear programming model to maximize the profit and then solve the LPP using simplex method. 16 M

3. Determine the optimal sequence of jobs that minimizes the total elapsed time. Also find the idle time for the machines A, B and C. The processing order of jobs is ACB.

Job	1	2	3	4	5	6
Machine A	12	10	9	14	7	9
Machine B	7	6	6	5	4	4
Machine C	6	5	6	4	2	4

16 M

4. The data on the operating costs per year and resale price of equipment A whose purchase price is Rs. 10,000 are given below:

Year	1	2	3	4	5	6	7
Operating cost (Rs.)	1500	1900	2300	2900	3600	4500	5500
Resale value (Rs.)	5000	2500	1250	600	400	400	400

What is the optimum period for replacement? 16 M

5. Patrons arrive at a reception counter at an average inter-arrival rate of 2 minutes. The receptionist in duty takes an average of one minute per patron.

a) What is the chance that a patron will straight way meet the receptionist?

b) For what portion of time the receptionist is busy?

c) What is the average queue length?

d) What is the average number of patrons in the system?

e) What is the average time a patron spends in the system?

f) What is the average waiting time a patron?

g) Suppose management wants to keep a second receptionist when the average waiting time of an arrival exceeds 1.5 minutes. Find what should be the average inter-arrival time to justify a second receptionist?

16 M

6. A company manufactures around 200 mopeds. Depending upon the availability of raw materials and other conditions, the daily production has been varying from 196 mopeds to 204 mopeds, whose probability distribution is as given below:

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

The finished mopeds are transported in a specially designed lorry that can accommodate only 200 mopeds. Using the given 15 random numbers: 82, 89, 78, 24, 53, 61, 18, 45, 04, 23, 50, 77, 27, 54, 10. Simulate the process find out

a) What will be the average number of mopeds waiting in the factory?

b) What will be the average number of empty spaces available in the lorry?

16 M