B.E.(with Credits)-Regular-Semester 2012 - Mechanical Engineering Sem VI

ME603 - Operations Research

P. Pages : 3 **GUG/W/16/5397**

Time : Three Hours * 3 5 6 4 * Max. Marks : 80

Notes : 1. All questions carry marks as indicated.
2. Answer Q.1 or Q. 2, Q. 3 or Q.4, Q.5, or Q.6, Q.7 or Q.8, Q.9 or Q.10.
3. Illustrate your answers wherever necessary with the help of neat sketches.
4. Use of non programmable calculator permitted.
5. Use of Random no chart normal std. distribution table is. permitted.

1. a) Discuss various types of recurring problems faced by industry. **8**

b) Explain the characteristics and limitations of O.R. **8**

OR

2. a) A firm uses Lathes, milling machines and grinding machines to produce two machine parts. Table represents the machining time required for each part, the machining time available on different machines and the profit on each machine part. **13**

Types of Machines	Machining Time Required for the machine part (minutes)		Max. Time available per week (minutes)
	I	II	
Lathe	12	6	3000
Milling m/c	4	10	2000
Grinding m/c	2	3	900
Profit/unit	Rs. 40	Rs. 100	

Find the number of parts I and II to be manufactured per week to maximize the profit use simplex method.

b) Write the dual of above L.P. Model. **3**

3. The owner of a small machine shop has four machinists available to assign to job for the day. Five jobs are offered with expected profit for each machinist on each job as follows (table 3.1). **16**

Machinist/Job	A	B	C	D	E
1	62	78	50	101	82
2	71	84	61	73	59
3	87	92	111	71	81
4	48	64	87	77	80

Table 3.1

Find the assignment of machinist to jobs that will result in maximum profit. Which job should be declined ?

OR

4. A steel company has three open hearth furnaces and five rolling mills. Transportation cost (Rs. Per Quintal) for shipping steel from furnace to rolling mill are given in table 4.1 **16**

Furnace	Mills					Capacities in Quintals
	M_1	M_2	M_3	M_4	M_5	
F_1	4	2	3	2	6	8
F_2	5	4	5	2	1	12
F_3	6	5	4	7	3	14
Requirement in Quintal	4	4	6	8	8	

Table 4.1

What is an optimal shipping schedule for minimum cost of Transportation ?

5. A project consist of Ten activities has the following characteristics. **16**

Activity	Depends On	To	tm	tp
A		4	5	12
B		1	1.5	5
C		2	3	4
D		3	4	11
E		2	3	4
F		1.5	2	2.5
G		1.5	3	4.5
H		2.5	3.5	7.5
I		1.5	2	2.5
J		1	2	3

1) Determine the critical path.
2) What is the probability that the project will be completed in 20 weeks ?
3) With in how many weeks would you expect the project to be completed with 65% chance ?

OR

6. Normal and crash durations with costs for various activities involved in a repair work is given in table 6.1 below. The indirect cost per day is Rs. 2000/- **16**

Table 6.1.

Activity	Time (Days)		Cost (Rs)	
	Normal	Crash	Normal	Crash
1-2	6	2	4000	12000
1-3	8	3	3000	6000
2-4	7	4	2800	4000
3-4	12	8	9000	11000
4-6	3	1	10000	13000
5-6	5	2	4900	7000
3-5	7	3	1800	5000
5-7	11	5	6600	12000
6-7	10	6	4000	8400

1) Draw Network

2) What is optimum time and cost ?

3) What is minimum time and cost ?

7. Following sells of goods have been observed for a certain type of bulb. The cost of replacing an individual bulb is Rs. 1.25. The decision is to made to replace all bulbs simultaneously and at fixed interval and also to replace individual as they fail in service. If cost of group replacement is Rs. 0.30/bulb. What is the best interval between the group replacement. At what group replacement cost per bulb would a policy preferable to the adopted policy ? Assume number of bulb = 1000. **16**

End of Week	1	2	3	4	5	6	7	8
Prob. of failure	·05	·13	·25	·43	·68	·88	·46	1·00

OR

8. a) i) Describe Re-order point system of Inventory Control. **4**

ii) Discuss ABC analysis and its importance. **4**

b) A manufacturer is required to purchase 2500 pieces of an item per year. The price of item is Rs. 10/-, order cost is Rs. 60/- and inventory carrying cost is 20% per year. **8**
Find out
1) Number of order issued per year
2) What should be the ordering quantity ?
3) Order interval considering 300 working days in a year
4) Optimal total expected system cost per period.

9. a) 1) Explain Basic Elements of Queuing Model. **4**

2) Explain service channel in detail. **4**

b) Auto vehicles arrive at a petrol pump, having one petrol unit, in a poission fashion with an average of 10 units per hour. The service time is distributed exponentially with a mean of 3 minutes. Find out. **8**
1) Average no of units in the system
2) Average waiting time for customer
3) Average length of Queue
4) Probability that number of units in the system is 3.

OR

10. a) Explain in detail "simulation". **5**

b) At a certain airport, it takes exactly five minutes to land an aeroplane, once it is given signal to land. The incoming planes have scheduled arrival times, at an average rate of eight per hour. Find out the expected time a plane have to wait. Take 10 samples. **11**

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