

B.E. (Mechanical Engineering) Model Curriculum Semester-VI
OE3021 - Operations Research Techniques

P. Pages : 3

Time : Three Hours



GUG/W/24/14072

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Assume suitable data wherever necessary.
 3. Use of non programmable calculator, Normal Standard distribution chart is permitted.
 4. Attempt 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.

1. a) Explain Objective, Scope and Limitations of Operations Research. 8
- b) Explain various phases of OR in detail. 8

OR

2. Solve the L.P. problem by simplex method. 16

$$\text{Max } Z = 3x_1 + 5x_2$$

$$\text{Sub to } 2x_1 + 6x_2 \leq 50$$

$$3x_1 + 2x_2 \leq 35$$

$$5x_1 - 3x_2 \leq 10$$

$$0x_1 + x_2 \leq 20$$

$$x_1, x_2 \geq 0$$

3. A production control superintendent finds the following information at his table in department A, B and C the no. of surplus pellets is 18, 27, 21 respectively. In department G, H, I, J the no. of pellets required is 14, 12, 23 and 17 respectively. This time in moving one pellet from one department to another is given in the following table. What is optimal distribution plan to minimize the moving time. 16

	G	H	I	J
A	13	25	12	21
B	18	23	14	9
C	23	15	12	16

OR

4. A company has one surplus truck in each of the cities A, B, C, D and E and one deficit truck in each of the cities 1, 2, 3, 4 and 5. The distance between the cities in kilometers is shown in the matrix below. Find the assignment of trucks from cities in surplus to cities in deficit so that the total distance covered by vehicle is minimum. 16

Cities (deficit) \ Cities (surplus)	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

5. A project consist of 9 activities. The details of the project are given in the table.

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Activity	Depends on	Time (days)
A	-	10
B	A	5
C	B	15
D	B, E, I	5
E	A	1
F	E, I	7
G	-	12
H	G	6
I	G	5

Construct a network to represent the project.

Find out:

- Critical path
- Establish free float, independent float for activity E, H and D.

OR

6. A project consists of six activities as shown below.

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Activity	Predecessor Activity	Normal		Crash	
		Time (Days)	Cost (Rs)	Time (Days)	Cost (Rs)
A	-	8	100	6	200
B	-	4	150	2	350
C	B	2	50	2	50
D	A	10	100	5	400
E	A	5	100	1	200
F	E	3	80	1	100

If the indirect cost is 75 Rs/Day

- Find the optimum project duration.
- Draw the activity network of the project.
- Find the critical path and duration.
- Determine the minimum cost schedule. Also calculate the optimum cost for project duration.

7. a) What is the necessity of maintaining inventory? What are the causes of poor inventory control?

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- b) A stockiest has to supply 400 units of a product every Monday to his customers. He gets the product at Rs. 50 per unit from the manufacture. The cost of ordering and transportation from the manufacture is Rs. 75 per order. The cost of carrying inventory is 7.5% per year of the cost of product. Find:

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- The economic lot size,
- The total optimal cost (including the capital cost)

OR

8. a) What is Inventory? Explain various inventory carrying cost.

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- b) A particular item has a demand of 9,000 units/year. The cost of one procurement is Rs. 100 and the holding cost per unit is Rs. 2.40 per year. The replacement is instantaneous and no shortages are allowed. Determine: 8
- The economic lot size,
 - The number of orders per year,
 - The time between orders,
 - The total cost per year if the cost of one unit is Rs. 1.

9. a) Explain in detail various steps involved in Decision Theory. 6

- b) A manufacturing company processes 6 different jobs on two machines. A and B. Numbers of units of each job and its processing times on A and B are given in given table. Find the optimal sequence, the total minimum elapsed time and idle time for each machine. 10

Job no.	No. of units of each job	Processing time	
		Machine A (minutes)	Machine B (minutes)
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7.5
6	3	6	14

OR

10. a) Explain in detail situation under which sequencing problems are classified. 6

- b) There are seven jobs, each of which has to go through the machines A and B in the order AB. Processing times in hours are given as 10

Job	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

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