

B.E. Electrical (Electronics & Power) Engineering (NEW / CBCS Pattern) Sem-VII
HSMC-3-1 : Operation Research and Management

P. Pages : 3

Time : Three Hours



GUG/W/22/14299

Max. Marks : 80

- Notes :
1. All questions carry equal marks.
 2. Answer five questions.
 3. Due credit will be given to neatness and adequate dimensions.
 4. Assume suitable data wherever necessary.
 5. Illustrate your answers wherever necessary with the help of neat sketches.
 6. Use of slide rule, Logarithmic Tables, Steam tables, Mollier's chart, Drawing instruments, Thermodynamic tables for moist air, Psychrometric charts and Refrigeration charts, Normal distribution chart is permitted.
 7. Solve Q. 1 or 2, Q. 3 or 4, Q. 5 or 6, Q. 7 or 8, Q. 9 or 10.
 8. Use of non-programmable calculator is permissible.

1. a) Discuss various phases of operation research and its importance. 8
- b) What is the role of operations research in decision making? 8

OR

2. a) Solve the following LPP by simplex method. 12
Minimize $Z = 5x_1 + 3x_2$
Subject to
 $2x_1 + 4x_2 < 12$
 $2x_1 + 2x_2 < 10$
 $5x_1 + 2x_2 > 10$
 $x_1, x_2 > 0$
- b) Verify the results of above LPP by graphical method. 4

3. A company has 5 jobs to be done the following matrix shows the return in RS. Assign the five jobs to five machines so as to maximize the total expected profit. 16

Job M/C	1	2	3	4	5
A	5	11	10	12	4
B	2	4	6	3	5
C	3	12	5	14	6
D	6	14	4	11	7
E	5	9	8	12	5

OR

4. Determine optimal solution to the problem given in Table 4.1. Obtain initial solution by VAM. 16

From / To	MARKET					SUPPLY
P	P1	M1	M2	M3	M4	
L	P2	6	4	9	1	40
A	P3	20	6	11	3	40
N	P4	7	1	0	14	50
T	P5	7	1	12	6	90
Demand		90	30	50	30	

5. A project has the characteristics as shown in table – C. Construct a PERT network. Find critical path and the probability to complete the project within 30 weeks. 16

Activities	Depends on	Optimistic Time (in weeks)	Most likely Time (in weeks)	Pessimistic Time
A	-	1	2	3
B	A	1	2	3
C	A	1	3	5
D	B	3	4	5
E	C	2	3	4
F	C	3	5	7
G	D, E	4	5	6
H	F	6	7	8
I	G, H	2	4	6
J	G, H	4	6	8
K	I	1	2	3
L	J	3	5	7

OR

6. A project consists of 6 activities as shown in table – D. Activity with its dependency, normal and crash duration with cost for various activities is as given in the table. The indirect cost is Rs. 80% - per day. 16

Find:

- a) Optimum cost and duration
b) Minimum duration within which the project can be completed.

Activity	Depends on	Normal		Crash	
		Cost (in Rs.)	Time (in days)	Cost(in Rs.)	Time (in days)
A	-	100	8	200	6
B	-	150	4	350	2
C	B	50	2	90	1
D	A	100	10	400	5
E	A	100	5	200	1
F	E	80	3	100	1

7. a) List and explain different types of costs in inventory system in detail. 6

- b) Given the data for an item of uniform demand, instantaneous delivery time and back order facility. Annual demand is 800 units, cost of an item is Rs. 40, ordering cost is Rs. 800 per order, inventory carrying cost is 40% per unit per year and back order cost is Rs. 10 per unit per year. Find **10**
- The economic order quantity
 - The maximum number of back orders.
 - The time between orders.
 - The total annual cost
 - The maximum inventory.

OR

8. a) Explain the following:
- ABC analysis. **6**
 - VED analysis **2**
- b) A company requires 16,000 units of raw material costing Rs. 2 per unit. The cost of placing an order is Rs. 45/- and the carrying costs are 10% per year per unit of the average inventory. Determine: i) Economical order quantity. ii) Cycle time iii) Total variable cost of managing the inventory. **8**
9. a) What are the various simplifying assumptions made while dealing with sequencing problems? **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.

OR

10. a) Explain how to process n jobs through m machines. **6**
- b) There are five jobs, each of which is to be processed through three machines A, B, C in the order ABC. Processing times in hours are **10**
- | | | | |
|-----|---|---|----|
| Job | A | B | C |
| 1 | 3 | 4 | 7 |
| 2 | 8 | 5 | 9 |
| 3 | 7 | 1 | 5 |
| 4 | 5 | 2 | 6 |
| 5 | 4 | 3 | 10 |
- Determine the optimum sequence for the five jobs and the minimum elapsed time.
