

B.E. Electrical (Electronics & Power) Engineering (Model Curriculum) Semester - VII  
**HSMC-3-1 - Operation Research and Management**

P. Pages : 3

Time : Three Hours



**GUG/S/23/14299**

Max. Marks : 80

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

1. a) State different types of model used in operation research. Explain briefly the general methods for solving these OR models. **6**
- b) Use the graphical method to solve the following LP problem. **10**
- Minimize  $Z = 20x_1 + 10x_2$
- Subject to constraints
- $x_1 + 2x_2 < 40$
- $3x_1 + x_2 > 30$
- $4x_1, 3x_2 > 60$
- $x_1, x_2 > 0$

**OR**

2. Solve the problem given in question no. 1 (b) by simplex method. **16**
3. A department has four subordinates and four tasks to be performed. The subordinates differ in efficiency and tasks differ in their difficulty. The estimates of the profit in Rs. Each man should earn is given in the effectiveness matrix (Table 3.1) How should the tasks be allocated, one to each man, so as to maximize the total earnings. **16**

Subordinate / Task	1	2	3	4
A	5	40	20	5
B	25	35	30	25
C	15	25	20	10
D	15	5	30	15

Table 8.1

**OR**

4. A manufacturer wants to ship 22 loads of his product as shown below. The matrix gives the kilometers from sources to the destinations. 16

		Destination					Supply
		D1	D2	D3	D4	D5	
Source	S1	5	8	6	6	3	8
	S2	4	7	7	6	5	5
	S3	8	4	6	6	4	9
Demand		4	4	5	4	8	

Shipping cost are Rs. 10 per load per km. What shipping schedule should be used to minimize total transportation cost?

5. A small project consist of seven activities, the details are given below. 16

		Time Estimation		
Activity	Depends on	$t_o$	$t_m$	$t_p$
A	-	1	3	7
B	A	2	6	14
C	A	3	3	3
D	B, C	4	10	22
E	B	3	7	15
F	D, E	2	5	14
G	D	4	4	4

- Find critical path.
- Find the probability that project is completed within 31 days.
- Find the probability that project is completed 2 days earlier that project duration.
- What project duration will have 55% confidence of completion?

**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:

- Optimum cost and duration.
- 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) Define inventory control. What are the various costs associated with inventory control? Explain each. **8**
- b) A manufacturing company purchases 9000 parts of a machine for its annual requirements, ordering monthly requirements at a time. Each part costs Rs. 20. The ordering cost per order is Rs. 15 and carrying cost are 15% of average inventory per year. Suggest economic purchasing policy for the company. What advice would you offer and how much would it save the company per year? **8**

**OR**

8. a) 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.
- b) List and explain different types of costs in inventory system in detail. **6**
9. a) What are the various simplifying assumptions made while dealing with the 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) 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.

- b) Explain how to process n jobs through m machines. **6**

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