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

P. Pages : 3

Time : Three Hours

Max. Marks : 80

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Notes : 1. All questions carry marks as indicated.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Illustrate your answers wherever necessary with the help of neat sketches.
5. 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. Non programmable Electronic calculator is allowed.
6. 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.
7. Use of Random number chart, normal standard distribution table is permitted.

1. a) Define OR. What are its characteristics? Explain each in detail. **8**

b) Explain the linear programming. What are the advantages and disadvantages of linear programming. **8**

OR

2. Solve the following LP problem by simplex method. **16**

Maximize $Z = x1 + 2x2 + 3x3 - x4$

Subject to $x1 + 2x2 + 3x3 = 15$

$2x1 + x2 + 5x3 = 20,$

$x1 + 2x2 + x3 + x4 = 10,$

$x1, x2, x3, x4 \geq 0$

3. At the end of the cycle of schedules a transportation firm has a surplus of 1 vehicle in each of the cities 1, 2, 3, 4 & 5 and deficit of 1 vehicle in each of the cities A, B, C, D, E & F. The cost in Rs. of transportation and handling between the cities with surplus and that with deficit is shown in the table. Find the assignment of surplus vehicle to deficit cities that will result in a minimum total cost. Which city will not receive a vehicle? **16**

To → From ↓	A	B	C	D	E	F
1	134	116	167	230	194	097
2	114	195	260	166	178	130
3	129	117	048	094	066	101
4	071	156	092	143	114	136
5	097	134	125	083	142	118

OR

4. A company has four manufacturing plants and five distributors. Every plant manufactures **16** the same product, which is sold at different prices to the distributors. Cost of manufacturing and cost of raw materials are different in different plant. The capacity is also different for different plant:

Item	Plants			
	1	2	3	4
Manufacturing cost per unit (Rs.)	12	10	8	8
Raw material cost per unit (Rs.)	8	7	7	5
Capacity per period (Units)	100	200	120	80

The sale prices and transportation cost per unit and requirement of the distributors is as follows:

Distributors	Transportation Cost (Rs.)				Sales Price (Rs.)	Requirement (Units)
	1	2	3	4		
A	4	7	4	3	30	80
B	8	9	7	8	32	120
C	2	7	6	10	28	150
D	10	7	5	8	34	70
E	2	5	8	9	30	80

Find initial solution by VAM and Optimum Solution by MODI method.

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

Activity	Preceding Activity	Time Estimates (Weeks)		
		t_o	t_m	t_p
A	---	4	5	12
B	---	1	1.5	5
C	A	2	3	4
D	A	3	4	11
E	A	2	3	4
F	C	1.5	2	2.5
G	D	1.5	3	4.5
H	B, E	2.5	3.5	7.5
I	H	1.5	2	2.5
J	F, G, I	1	2	3

Draw the project network and find

i)   PERT critical path

ii) Expected project length

iii) Probability that project will be completed in 20 weeks.

OR

6.   Indirect cost is Rs. 80 per day and activity with its dependency are given find optimum   **16**
project duration.

Activity	Depends on	Normal		Crash	
		Cost	Time	Cost	Time
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)   A company purchases 10000 items per year for use in its production shop. The unit cost is   **8**
Rs.10 per year, holding cost is Rs. 0.80 per month and cost of making purchases is
Rs. 200/-, Determine the following if no shortages are allowed.
i) The optimum order quantity.   ii) The optimum total year cost.
iii) The number of orders per year   iv) The time between orders

    b)   Why it is necessary to maintain the inventory? Explain ABC analysis in detail.   **8**

<div align="center">OR</div>

8.   a)   An aircraft company uses rivets at an approximately constant rate of 5000 kg per year.   **10**
The rivets cost Rs. 20 per kg and company estimates that is costs Rs. 200/- to place an
order and carrying cost of inventory is 10% per year.
i)   What is ordering quantity? How frequently should order of rivets be placed?
ii)   If actual costs are Rs. 500/- to place an order and 15% carrying cost, the optimal policy
     would change. How much company losing per year because of imperfect cost
     information?

    b)   Define   **6**
i)   Economic ordering quantity   ii)   Replenishment period
iii)   Lead time

9.   a)   Explain the following terms in the context of sequencing problems: **6**
i)   Total elapsed time   ii)   Idle time
iii)   Processing order

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

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. Also find
idle time for machines A and B.

<div align="center">OR</div>

10.   a)   Explain the importance of sequencing problem. What are the various methods of solving   **6**
sequencing problems? Briefly explain them.

     b)   Explain the steps in decision theory approach in detail.   **5**

     c)   Under which types of environments the decisions are made? Explain each in brief.   **5**

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