

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

P. Pages : 3

Time : Three Hours



**GUG/W/24/14299**

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
  2. Assume suitable data wherever necessary.
  3. Illustrate your answers wherever necessary with the help of neat sketches.
  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.
  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. Due credit will be given to neatness.
  7. Use of Random number chart, normal standard distribution table is permitted.

1. a) What are the different phases in operations research? Explain them in detail. 8
- b) A firm manufactures two products A and B on which the profit earned per unit are Rs. 3 and Rs. 4 Resp. Each product is processed on two machines M1 & M2. Product 'A' required 1 minutes of processing time on M1 & 2 minutes on M2 while 'B' required 1 minute on M1 & 1 minute on M2. Machine M1 is available for not more than 7 hours and 30 minutes while machine M2 available for 10 hours. Find the number of units of product to be manufactured by get maximum profit. (Use graphical method only). 8

**OR**

2. Solve the following LP problem by simplex method. 16  
Maximize  $Z = 4x_1 + 3x_2 + 6x_3$ ,  
Subject to  $2x_1 + 3x_2 + 2x_3 \leq 440$   
 $4x_1 + 3x_3 \leq 470$ ,  
 $2x_1 + 5x_2 \leq 430$ ,  
 $x_1, x_2, x_3 \geq 0$
3. Production cost of products P1, P2 and P3 per unit manufactured on machine m1, m2, m3 and m4 are as tabulated in table-1. Sales price per unit is as under. P1-Rs. 70/unit, P2-Rs.85/unit P3 – Rs. 60/unit. Decide product machine combination for maximization of total profit. 16

M/c Product	m1	m2	m3	m4
P1	40	50	30	25
P2	30	20	30	30
P3	30	35	25	25

Table - 1

**OR**

4. A company has factories at A, B & C with supply ware houses at D, E, F, & G factory capacities are 230, 280 & 180 resp. for regular production. If overtime production is utilized capacities can be increased to 300, 360 & 190 resp. The current ware house requirements are 165, 175, 205 & 165 resp. Unit shipping cost between factory and ware house are given in the table-2. Determine optimum distribution for the company to minimize cost if the implement unit overtime costs are Rs. 5, 4 & 6 resp. 16

W.H. → Factory ↓	D	E	F	G
A	7	8	9	11
B	5	11	8	7
C	4	23	3	12

Table - 2

5. A small project consist of even activities has the characteristics as shown in table-3. Draw the PERT network and find 16
- PERT critical path
  - The probability of completing the project in 18 days
  - The time limit within which the project will be completed with confidence level of 80%

Activity	Preceding Activity	Time Estimate Days		
		$t_o$	$t_m$	$t_p$
A	---	1	1	7
B	---	1	4	7
C	---	2	2	8
D	A	1	1	4
E	B	2	5	14
F	C	2	5	8
G	D, E	3	6	15

Table – 3

**OR**

6. For the project as shown in table-4, if indirect cost is Rs. 300, find 1. Normal cost and duration of project 2. Optimum duration and minimum cost of project. 16

Activity	Event	Normal		Crash	
		Time	Cost	Time	Cost
A	10-20	6	1400	4	1900
B	10-30	8	2000	5	2800
C	20-30	4	1100	2	1500
D	20-40	3	800	2	1400
D1	30-40	--	--	--	--
E	30-50	6	900	3	1600
F	40-50	10	2500	6	3500
G	50-60	3	500	2	800

Table – 4

7. a) What is demand forecasting? Discuss the various techniques of demand forecasting. 8
- b) Why it is necessary to maintain the inventory? Explain ABC analysis in detail. 8

**OR**

8. a) ABC manufacturing company purchases 9000 parts of a machine for in annual requirement, ordering one month's usage at a time. Each part costs Rs. 20. The ordering cost per order is Rs. 15, and the carrying charges are 15% of the average inventory per year. Suggest a more economical purchasing policy for the company. What advice would you offer and how much would it save the company per year? 8
- b) Explain in detail the three costs considered in inventory control mode. 8
9. a) What are various conditions are to be assumed while processing n jobs through two machines? 6
- b) A machine operator has to perform three operations: turning, threading and knurling on a number of different jobs. The time required to perform these operations in minutes for each job is shown in table-5. Determine the order in which the jobs should be processed in order to minimize the total time required to turn out all the jobs. Also find the idle times for the three operations. 10

Job No.	Time for operations in minutes		
	Turning	Threading	Knurling
1	3	8	13
2	12	6	14
3	5	4	9
4	2	6	12
5	9	3	8
6	11	1	13

Table – 5

**OR**

10. a) Write short notes on: 6
- i) Decision tree. ii) Laplace criterion in decision theory.
- b) Use the graphical method to minimize the time required to process the following jobs on the machine as shown in table-6. For each machine specify the job which should be done first. Also calculate the total elapsed time to complete both jobs. 10

Job1	Sequence Time (hr)	A	B	C	D	E
		6	8	4	12	4
Job 2	Sequence Time (hr)	B	C	A	D	E
		10	8	6	4	12

Table – 6

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