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B. E. (Seventh Semester) Examination, April-May 2021

(New Scheme)

(CSE, IT Engg. Branch)

OPERATION RESEARCH

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Attempt all questions. Part (a) is compulsory, attempt any* ***two*** *parts from (b), (c) and (d) part of each question.*

Unit-I

1. (a) What is Constraints? 2

(b) Solve the following linear programming problem using graphical method. 7

Minimize $z = -x_1 + 2x_2$

Subject to ; $-x_1 + 3x_2 \leq 10$

$x_1 + x_2 \leq 6$

$x_1 - x_2 \leq 2$

such that, $x_1, x_2 = 0$

(c) Max $z = 3x_1 + 2x_2$

Subject to : $x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

and $x, x_2 \geq 0$

Solve with simplex method and find optimal solution. 7

(d) Use Big-M method to solve the following LPP. 7

Min $z = 12x_1 + 20x_2$

Subject to : $6x_1 + 8x_2 \geq 100$

$7x_1 + 12x_2 \geq 120$

$x_1, x_2 \geq 0$

Unit-II

2. (a) What are the conditions for the applications of the optimality test in case of transportation problem? 2

(b) Obtain an initial basic feasible solution to the following transportation problem using North-West corner rule. 7

	D	*E*	*F*	*G*	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

(c) Solve the following assignment problem : 7

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

(d) Find the initial basic feasible solution of the following transportation problem by Modi method 7

	warehouse				
	W_1	W_2	W_3	W_4	Capacity
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement	5	8	7	14	34 (Total)

Unit-III

3. (a) What are the different types of inventory cost? 2

(b) A particular item has a demand of 9,000 units/year. The cost of one procurement is ₹ 100 and the holding cost per unit is ₹ 2·40 per year. The replacement is instantaneous and no shortages are allowed. Determine : 7

(i) the economic lot size.

(ii) the number of orders per year.

(iii) the time between order.

(iv) the total cost per year if the cost of one unit is Re 1.

(c) ABC manufacturing company purshases 9,000 parts of a machine for its annual requirement, ordering one month's usage at a time. Each part costs ₹ 20. The ordering cost per order is ₹ 15, and the carrying charges are 15% of the average inventory per year. You have been asked to suggest a more economical purchasing policy for the company. What advice would you after and how much would it save the company per year? 7

(d) The cost of holding an item in stock is ₹ 2 per unit and the shortage cost is ₹ 8. If ₹ 2 is the purchasing cost per unit, determine the optimal order level of inventory, given the following probability distribution : 7

R :	0	1	2	3	4	5
$P(R)$:	0·05	0·25	0·20	0·15	0·20	0·15

Unit-IV

4. (a) What do you mean by queuing model? 2

(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 of :

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 T and idle time for machines A and B. 7

(c) Find the sequence that minimizes the total elapsed time required to complete the following tasks. Each task is processed in any two of the machines. A, B and C in any order. 7

	Task 1	2	3	4	5	6	7
Machine A	12	6	5	3	5	7	6
Machine B	7	8	9	8	7	8	3
Machine C	3	4	11	5	2	8	4

(d) Using graphical method, determine the optimal sequence needed to process jobs 1 and 2 on five machines, A, B, C, D and E. For each machine find the job which should be done first. Also calculate the total time needed to complete both the jobs. 7

		A	B	C	D	E
Job 1	Sequence					
	Time (hrs)	1	2	3	5	1
Job 2	Sequence	C	A	D	E	B
	Time (hrs)	3	4	2	1	5

Unit-V

5. (a) Write formula for : 2

(i) Total float

(ii) Free float

(iii) Independent float

(iv) Interfering float

(b) A project schedule has the following characteristics : 7

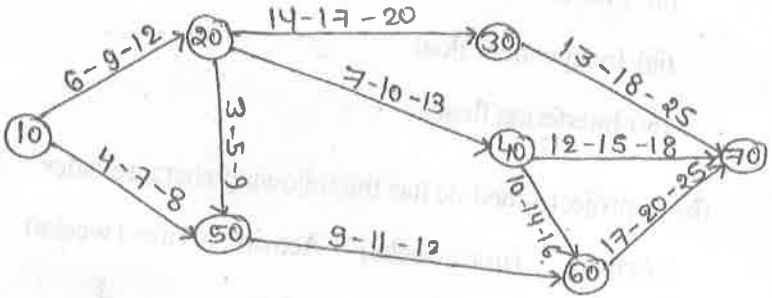
Activity	Time (weeks)	Activity	Time (weeks)
1-2	4	5-6	4
1-3	1	5-7	8
2-4	1	6-8	1
3-4	1	7-8	2
3-5	6	8-10	5
4-9	3	9-10	7

(i) Construct the network

(ii) Compute E and L for each event, and

(iii) Find the critical path.

(c) Consider the network shown fig. for each activity, the three estimates t_0, t_m and t_p are given along the arrows in the $t_0 - t_m - t_p$ order. Determine variance and expected time for each activity. 7



(d) In the PERT network shown in fig. the activity time estimates (in weeks) are given along the arrows. If the scheduled completion time is 23 weeks, calculate the latest possible occurrence times of the events. Calculate the slack for each event and identity the

critical path. What is the probability that the project will be completed on the scheduled data? 7