

CBCS SCHEME



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Eighth Semester B.E. Degree Examination, July/August 2021 Operations Research

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions.

- 1 a. Define Operation Research. List the characteristics of operation research. (10 Marks)
b. Solve the following LPP by graphical method:
Max $z = 4x_1 + 3x_2$
Subjected to $4x_1 + 3x_2 \leq 24$
 $x_1 \leq 4.5$
 $x_2 \leq 6$
 $x_1 \geq 0, x_2 \geq 0$ (10 Marks)
- 2 a. Explain the three components of linear programming model. (10 Marks)
b. Solve the given LPP by graphical method.
Max $z = 80x_1 + 55x_2$
Subjected to $4x_1 + 2x_2 \leq 40$
 $2x_1 + 4x_2 \leq 32$
 $x_1 \geq 0, x_2 \geq 0$ (10 Marks)
- 3 a. Define duality in linear programming. Explain the concept of solving duality in Linear Programming Problem. (06 Marks)
b. Solve the LPP by simplex method.
Minimize $z = x_1 - 3x_2 + 2x_3$
Subjected to $3x_1 - x_2 + 3x_3 \leq 7$
 $-2x_1 + 4x_2 \leq 12$
 $-4x_1 + 3x_2 + 8x_3 \leq 10$
and $x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$ (14 Marks)
- 4 a. State the importance of slack variable, surplus variable and artificial variable. (06 Marks)
b. Solve the following LPP by two phase method:
Maximize $z = 12x_1 + 15x_2 + 9x_3$
Subjected to $8x_1 + 16x_2 + 12x_3 \leq 250$
 $4x_1 + 8x_2 + 10x_3 \geq 80$
 $7x_1 + 9x_2 + 8x_3 = 105$
 $x_1, x_2, x_3 \geq 0$ (14 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- 5 a. State the objectives and applications of transportation problem. (06 Marks)
 b. Solve the given transportation problem,

		Destination			
		A	B	C	
Sources	1	5	1	7	10
	2	6	4	6	80
	3	3	2	5	15
		75	20	50	

The penalty cost per unit of unsatisfied demand are Rs.5, Rs.3, and Rs.2 for destinations A, B and C.

- (i) Formulate and obtain the feasible solution by VAM.
 (ii) Find the optimum solution by modified distribution method. (14 Marks)
- 6 a. Differentiate between transportation problem, assignment problem and travelling salesman problem. (06 Marks)
 b. A Salesman wants to visit cities A, B, C, D and E. He does not want to visit any city twice before completing the tour all the cities and wishes to return to his home city, the starting stations cost of going from one city to another in rupees is given in Table Q6(b). Find the least cost route.

	A	B	C	D	E
A	X	2	5	7	1
B	6	X	3	8	2
C	8	7	X	4	7
D	12	4	6	X	5
E	1	3	2	8	X

Table Q6(b)

(14 Marks)

- 7 a. List and explain the basic steps in PERT/CPM. (10 Marks)
 b. Determine the early start time and latest start time in respect of all node points and identify the critical path for the following network. Write the network table. (10 Marks)

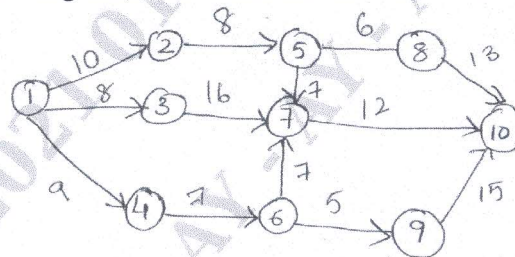


Fig Q7(b)

- 8 a. List and explain basic terms in sequencing. (10 Marks)
 b. A Machine operator has to perform three operations A, B and 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. Find the total elapsed time of any 5 combinations

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

(10 Marks)

- 9 a. State the properties of game theory. (10 Marks)
 b. Solve the game of graphical method.

$$\begin{array}{c}
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 \end{array}
 \begin{array}{cc}
 & B_1 & B_2 \\
 A_1 & \begin{bmatrix} -2 & 0 \end{bmatrix} \\
 A_2 & \begin{bmatrix} 3 & -1 \end{bmatrix} \\
 A_3 & \begin{bmatrix} -3 & 2 \end{bmatrix} \\
 A_4 & \begin{bmatrix} 5 & -4 \end{bmatrix}
 \end{array}$$

(10 Marks)

- 10 a. List and explain the operating characteristics of a queuing system. (10 Marks)
 b. A self services store employs one cashier and its counter. Nine customers arrive on an average every 5 minutes while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival rate and exponential distribution for time find :
 (i) Average number of customers in system.
 (ii) Average queue length
 (iii) Average time customer spends in system.
 (iv) Average time customer waits before being served. (10 Marks)

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