CBCS SCHEME

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15CS653

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Operation Research

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define operation research. List and explain the various phases of an operation research study. **(08 Marks)**

b. A firm manufactures three products A, B and C. The profits per unit product are Rs.3, Rs.2 and Rs.4 respectively. The firm has two machines and the required processing time in minutes for each machine on each product is given below :

	Product		
Machine	A	B	C
X	4	3	5
Y	2	2	4

Machines X and Y have 2000 and 1500 machine-minutes respectively. The firm must manufacture 100A's, 200B's and 50C's but not more than 150A's. Set up an LP model to maximize the profit. **(08 Marks)**

OR

2 a. Use the graphical method to solve the following LPP :

Maximize $Z = x + 0.5y$

Subject to constraints $3x + 2y \leq 12$

$5x \leq 10$

$x + y \leq 18$

$-x + y \geq 4$

where $x, y \geq 0$. **(12 Marks)**

b. Define :i) Feasible solution ii) unbounded solution iii) Fesible region iv) Optimal solution. **(04 Marks)**

Module-2

3 a. Define slack variable, surplus variable and basic solution. **(06 Marks)**

b. Solve the following LPP using simplex method,

$Z_{max} = 2x_1 + 2x_2 + 4x_3$

Subject to the constraint

$2x_1 + 3x_2 + x_3 \leq 240$

$x_1 + x_2 + 3x_3 \leq 300$

$x_1 + 3x_2 + x_3 \leq 300$

$x_1, x_2, x_3 \geq 0.$ **(10 Marks)**

OR

4 a. Solve the following LPP by two phase method
$Z_{max} = 3x_1 - x_2$
Subject to the constraint
$2x_1 + x_2 \geq 2$
$x_1 + 3x_2 \leq 2$
$x_2 \leq 4$
$x_1, x_2 \geq 0.$ **(08 Marks)**

b. Solve the following LPP by Big-M method,
Maximize $Z = 2x_1 + 3x_2 + 10x_3$
Subject to $x_1 + 2x_3 = 0$
$x_2 + x_3 = 1$
$x_1, x_2, x_3 \geq 0.$ **(08 Marks)**

Module-3

5 a. Write the dual of the following primal LPP.
Max $z = 3x_1 - x_2 + x_3$
Subject to : $4x_1 - x_2 \leq 8$
$8x_1 + x_2 + 3x_3 \geq 12$
$5x_1 - 6x_3 \leq 13$
$x_1, x_2, x_3 \geq 0.$ **(08 Marks)**

b. Use dual Simplex method to solve the following LPP :
Max $z = -3x_1 - x_2$
Subject to : $x_1 + x_2 \geq 1$
$2x_1 + 3x_2 \geq 2$
$x_1, x_2 \geq 0.$ **(08 Marks)**

OR

6 a. List out the procedural steps used to solve a LPP using dual simplex method. **(08 Marks)**
b. Explain briefly the essence of duality theory with an example. **(08 Marks)**

Module-4

7 a. Find the initial basic feasible solution by using North–West corner rule. **(06 Marks)**

	D_1	D_2	D_3	D_4	Supply
O_1	1	5	3	3	34
O_2	3	3	1	2	15
O_3	0	2	2	3	12
O_4	2	7	2	4	19
Demand	21	25	17	17	80

b. Find the initial basic feasible solution using Vogel's approximation method. **(10 Marks)**

	W_1	W_2	W_3	W_4	Availability
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	

OR

8 a. Solve by matrix minima method and obtain an optimal solution for the following problem:

				Available
	50	30	220	1
From	90	45	170	3
	250	200	50	4
Required	4	2	2	

(10 Marks)

b. Solve the following assignment problem :

	J_1	J_2	J_3	J_4
A	2	10	9	7
B	15	4	14	8
C	13	14	16	11
D	3	15	13	8

(06 Marks)

Module-5

9 a. Explain the following:
i) Minimax and Maximin principle.
ii) Pure and mixed strategies
iii) Two person zero sum game. **(06 Marks)**

b. Solve the following game using the concept of dominance. Write the strategies adopted by each player and find value of game. **(10 Marks)**

		B				
		I	II	III	IV	V
A	I	6	15	30	21	6
	II	3	3	6	6	4
	III	12	12	24	36	3

OR

10 a. Solve the following game by graphical method:

		B				
		I	II	III	IV	V
A	I	2	-1	5	-2	6
	II	-2	4	-3	1	0

(06 Marks)

b. Explain briefly: i) Genetic algorithm ii) Tabu search. **(10 Marks)**

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