23105593

QP CODE: 23105593

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE EXAMINATIONS, MARCH 2023

Sixth Semester

CHOICE BASED CORE COURSE - MM6CBT01 - OPERATIONS RESEARCH

Common for B.Sc Mathematics Model I & B.Sc Mathematics Model II Computer Science

2017 Admission Onwards

8F2C637F

Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

*Each question carries **2** marks.*

1. Define basic feasible solution to an LP problem. When it becomes degenerate.
2. Use the Graphical method to solve the given LP problem.
   Maximize $Z = 60x_1 + 40x_2$ subject to the constraints
   $x_1 \leq 25$, $x_2 \leq 35$, $2x_1 + x_2 = 60$, $x1, x2 \geq 0$.
3. Convert into standard form
   Maximize $Z = x_1 + 2x_2$ subject to the constraints
   $-x_1 + 2x_2 \leq 8$, $x_1 + 2x_2 \leq 12$, $x_1 - 2x_2 \leq 3$, $x_1, x_2 \geq 0$.
4. Define slack variable.Introduce slack variable in proper way for the constraint $4x - 3y \leq 2$.
5. What is the indicator of an unbounded solutions in LP problem.
6. Write symmetric form of Primal LP problem and corresponding dual LP problem.
7. Give the general mathematical model of the Transportation Problem.
8. How is an unbalanced Assignment Problem resolved for solution?
9. Find an Initial Basic Feasible Solution by North West Corner Method:

	D1	D2	D3	D4	Supply
O1	6	4	1	5	14
O2	8	9	2	7	16
O3	4	3	6	2	5
Demand	6	10	15	4	

10. Find an optimal assignment to minimize cost:

		Programmes		
		A	B	C
Programmers	1	2	6	2
	2	1	4	1
	3	5	3	8

11. Define minimax principle and minimax value of the game.

12. Use principle of dominance to reduce the size of the payoff matrix to 2 x 2 .

	Player B		
Player A	B_1	B_2	B_3
A_1	3	-2	4
A_2	-1	4	2
A_3	2	2	6

(10×2=20)

Part B

*Answer any **six** questions.*

*Each question carries **5** marks.*

13. A firm makes two products X and Y, and has a total production capacity of 9 tonnes per day . Both X and Y require the same production capacity. The firm has a permanent contract to supply at least 2 tonnes of X and at least 3 tonnes of Y per day to another company . Each tonnes of X requires 20 machine hours of production time and each tonne of Y requires 50 machine hours of production time. The daily maximum possible number of machine hours is 360. All the firm's output can be sold. The profit made is Rs. 80 per tonne of X and Rs. 120 per tonne of Y, Formulate this problem as an LP model .

14. Solve the LP problem graphically. Is there exists multiple optimal solutions. If so, find it.
Maximize $Z = 10x_1 + 6x_2$ subject to the constraints
$5x_1 + 3x_2 \leq 30$,
$x_1 + 2x_2 \leq 18$, x1 , x2 ≥ 0.

15. Find first two tables of Simplex method of solving LP problem. ,
Maximize Z = 3000 x + 2000 y , Subject to the constraints
5x +2 y $\leq$ 180,
3x + 3y $\leq$ 135, x , y , z $\geq$ 0 .

16. Solve the following LP problem using simplex method.

Maximize $Z = 2x + 5y$ subject to the constraints

$x + 2y \leq 8$, $x \leq 4$,

$y \leq 3$, $y \geq 0$ and x unrestricted.

17. Write the dual of the following LP problem.

Maximize $Z = x_1 - x_2 + 3x_3$ subject to the constraints

$x_1 + x_2 + x_3 \leq 10$,

$2x_1 - x_2 - x_3 \leq 2$,

$2x_1 - 2x_2 - 3x_3 \leq 6$ and x_1 , x_2 , $x_3 \geq 0$.

18. Prove that dual of a dual is primal.

19. Find an Initial Basic Feasible Solution by Vogel's Approximation Method and test for optimality:

	D1	D2	D3	D4	Supply
O1	6	4	1	5	14
O2	8	9	2	7	16
O3	4	3	6	2	5
Demand	6	10	15	4	

20. Find an optimal assignment to minimize cost:

		Flight Number			
		I	II	III	IV
Pilot	1	9	14	19	15
	2	7	17	20	19
	3	10	12	18	19
	4	10	15	21	16

21. Solve the game and find the value of the game .

	Player B			
Player A	B_1	B_2	B_3	B_4
A_1	2	2	3	-2
A_2	4	3	2	6

(6×5=30)

Part C

*Answer any **two** questions.*

*Each question carries **15** marks.*

22. Use Big –M method to solve the following LP problem.

Minimize $Z = 5x + 3y$ subject to the constraints

$2x + 4y \leq 12$,

$2x + 2y = 10$,

$5x + 2y \geq 10$, $x, y \geq 0$.

23. Determine a transportation schedule to minimize cost, after finding an Initial Basic Feasible Solution by the North West Corner Method :

	D1	D2	D3	Supply
O1	8	5	6	120
O2	15	10	12	80
O3	3	9	10	80
Demand	150	80	50	

24. Find an optimal assignment to maximize profit:

		District				
		I	II	III	IV	V
Salesman	1	32	38	40	28	40
	2	40	24	28	21	36
	3	41	27	33	30	37
	4	22	38	41	36	36
	5	29	33	40	35	39

25. Transform the game into an equivalent linear programming problem and solve the game for two players A and B by using the simplex method

	Player B		
Player A	B_1	B_2	B_3
A_1	1	-1	3
A_2	3	5	-3
A_3	6	2	-2

(2×15=30)