B.Sc DEGREE (CBCS) REGULAR / REAPPEARANCE / MERCY CHANCE EXAMINATIONS, FEBRUARY 2025

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

228A377E

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. How can you identity a key row in simplex table and Define key element?

3. Define slack variable. Introduce slack variable in proper way for the constraint $5x - 6y + 3z \leq 12$.

4. Describe the rules of breaking tie for entering basic variables, while solving an LP problem.

5. What is the indicator of infeasible solutions in LP problem?

6. Write any two standard results on duality.

7. What are the rim conditions for the existence of a feasible solution for a Transportation Problem?

8. Name any two methods for solving an Assignment Problem.

9. Find an Initial Basic Feasible Solution by Least Cost Method:

	D1	D2	D3	Supply
O1	2	7	4	5
O2	3	3	1	8
O3	5	4	7	7
O4	1	6	2	14
Demand	7	9	18	

10. Find an optimal assignment to minimize cost:

Job

Workers		A	B	C
	1	18	17	16
	2	15	13	14
	3	19	20	21

11. What are the methods to solve a game without saddle point?

12. Explain the graphical method of solving 2 X n and m X 2 games.

(10×2=20)

Part B

Answer any six questions.

Each question carries 5 marks.

13. A firm plans to purchase at least 200 quintals of scrap containing high quality metal X and low quality metal Y . It decides that the scarp to be purchased must contain at least 100 quintals of metal X and not more than 35 quintals of metal Y. The firm can purchase the scarp from two suppliers A and B.in unlimited quantities. The percentage of X and Y metals in terms of weight in the scarp supplied by A and B is given below.

Metals	Supplier A	Supplier B
X	25%	75%
Y	10%	20%

The price of A's scarp is RS 200 per quintal and that of B is Rs.400 per quintal. The firm wants to determine the quantities that it should buy from the two suppliers so that the total cost is minimized. Formulate this problem as an LP Problem .

14. Use the Graphical method to solve the given LP problem.

Minimize $Z = 200x_1 + 400x_2$ subject to the constraints

$x_1 + x_2 \geq 200$, $x_1 + 3x_2 \geq 400$, $x_1 + 2x_2 \leq 350$, $x_1 , x_2 \geq 0$

15. Solve the LP problem graphically. What is the peculiarity of the solution.

Maximize $Z = 3x_1 + 4x_2$ subject to the constraints

$x_1 - x_2 = -1$,

$-x_1 + x_2 \leq 0$, $x_1 , x_2 \geq 0$.

16. Use Big –M method and find first two tables to solve the following LP problem.

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

    2x + 4y ≤ 12

    2x + 2y = 10,

    5x + 2y ≥ 10,   x, y ≥ 0.

17. Write the dual of the following LP problem.

     Minimize Z = x1 – 3x2 - 2x3 subject to the constraints

    3x1 - x2 + 2x3 ≤ 7 ,

    2x1 - 4x2   ≥ 12 ,

    -4x1 + 3x2 + 8x3 = 10,   x1 , x2 ≥ 0 and x3 unrestricted in sign.

18. Write the advantages of duality.

19. Find an Initial Basic Feasible Solution by Least Cost Method and test for optimality:

	D1	D2	D3	Supply
O1	5	1	7	10
O2	6	4	6	80
O3	3	2	5	15
Demand	75	20	50	

20. Find an optimal assignment to minimize cost:

Flight Number

Pilot		I	II	III	IV	V
	1	2	8	-	5	6
	2	0	1	8	2	6
	3	5	6	1	4	-
	4	7	4	8	2	3
	5	5	4	0	6	7

21. Solve the game whose payoff matrix is given by

Player B

Player A	B_1	B_2	B_3
A_1	1	3	1
A_2	0	-4	-3
A_3	1	5	-1

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Solve using Simplex method,

Minimize $Z = x - 3y + 2z$, Subject to the constraints

$3x - y + 2z \leq 7$

$-2x + 4y \leq 12$

$-4x + 3y + 8z \leq 10$, $x, y, z \geq 0$.

Solve the following Transportation Problem to minimize cost and find an alternate solution if it exists:

23.

	D1	D2	D3	Supply
O1	1000	10	5	90
O2	12	9	4	50
O3	7	3	11	80
O4	9	5	7	60
Demand	120	100	110	

24. Find an optimal assignment to minimize cost. Also find an alternate optimal assignment, if it exists:

District

		I	II	III	IV	V
	1	9	3	1	13	1
Salesman	2	1	17	13	20	5
	3	0	14	8	11	4
	4	19	3	0	5	5
	5	12	8	1	6	2

25. Solve the game for two players A and B using linear programming method for which pay off matrix of A is given as

Player B

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

(2×15=30)