QP CODE: 23146797

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Reg No : .....

Name : .....

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

First Semester

B.Sc Mathematics Model II Computer Science

Complementary Course - MM1CMT02 - MATHEMATICS - OPERATIONS RESEARCH - LINEAR PROGRAMMING

2017 Admission Onwards

DC5DEB5B

Time: 3 Hours Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. Define the term linear combination of vectors.
2. Define dimension of a vector space.
3. Define boundary point of a set.
4. Define a closed set.
5. Define a line and half line in E_n.
6. Define the term convex polyhedron.
7. Distinguish between separating and supporting hyperplanes.
8. Define global minima of a function $f(\mathbf{X})$
9. Define a convex function.
10. Explain general linear programming problem.
11. How can you formulate an LPP problem when one of the variable is unrestricted.
12. Explain Slack variable in a linear programming problem.

(10×2=20)

Part B

*Answer any **six** questions.*

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

13. Explain consistant and inconsistant system of linear equations.

14. Solve the equations $x_1 + x_2 - 2x_3 + x_4 + 3x_5 = 1$
$2x_1 - x_2 + 2x_3 + 2x_4 + 6x_5 = 2$
$3x_1 + 2x_2 - 4x_3 - 3x_4 - 9x_5 = 3$

15. Indicate the following form is positive definite or negative definite
$x_1^2 - 2x_2^2 + x_3^2$

16. Classify different types quadratic forms with examples.

17. Prove that $f(x) = x^2, x \in R$ is a convex function.

18. State the theorem which establishes the relation between the minimum of the objective function and vertex of S_F, the feasible set.

19. Solve graphically
Maximize $3x_1 + 2x_2$
subject to $x_1 - x_2 \leq 1, \quad x_1 + x_2 \geq 3, \quad x_1, x_2 \geq 0$

Solve graphically
Maximize $-3x_1 + 2x_2$
subject to $x_1 \leq 3, \quad x_1 - x_2 \leq 0, \quad x_1, x_2 \geq 0$

20. Use simplex method to solve

Maximize $f = x_1 + 2x_2$
Subject to $-x_1 + 2x_2 \leq 8$
$x_1 + 2x_2 \leq 12$
$x_1 - x_2 \leq 3$
$x_1 \geq 0, x_2 \geq 0$

21. Use simplex method to solve

Maximize $f = 2x_1 + 4x_2 + x_3 + x_4$
Subject to
$x_1 + 3x_2 + x_4 \leq 4$
$2x_1 + x_2 \leq 3$
$x_2 + 4x_3 + x_4 \leq 3$
$x_1, x_2, x_3, x_4 \geq 0$

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Show that the following quadratic form is positive definite

$7x_1^2 + 10x_2^2 + 7x_3^2 - 4x_1x_2 + 2x_1x_3 - 4x_2x_3$

23. Solve graphically

Maximize $f = 5x_1 + 3x_2$

Subject to

$4x_1 + 5x_2 \leq 10$

$5x_1 + 2x_2 \leq 10$

$3x_1 + 8x_2 \leq 12$

$x_1 \geq 0, x_2 \geq 0$

24. Solve by Big-M Method

Minimize $f = x_1 + 3x_2$

Subject to

$x_1 + x_2 \geq 3$

$x_1 - 2x_2 \leq 2$

$-x_1 + x_2 \leq 2$

$x_1 \geq 0, x_2 \geq 0$

25. Solve

Maximize $f = 3x_1 + 4x_2$

Subject to

$4x_1 + 3x_2 \geq 12$

$x_1 + 2x_2 \leq 2$

$x_1 \geq 0, x_2 \geq 0$

(2×15=30)