23104768

QP CODE: 23104768

Reg No : .....

Name : .....

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

First Semester

B.Sc Mathematics Model II Computer Science

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

2017 Admission Onwards

2FCAC5DE

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 a subspace of a vector space.
3. Define δ- neighbourhood of a point.
4. Define a closed set.
5. Define a convex set.
6. Define the term convex polyhedron.
7. True or false: Every polytope has a vertex. Justify your answer with an example.
8. Define local minima of a function $f(\mathbf{X})$
9. Define a concave function.
10. Define a basic solution.
11. Define the term basic feasible solution.
12. Explain Slack variable in a linear programming problem.

(10×2=20)

Part B

*Answer any **six** questions.*

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

13. Determine whether $\mathbf{X} = [0\ 1\ 1]$ is a linear combination of $\mathbf{X} = [0\ 1\ 1]$ and $\mathbf{X}_2 = [1\ 1\ 1]$.

14. Solve the following system of homogeneous equations:
$$4x + y + 2z = 0 - 3x + 2y + 4z = 08x - y - 2z = 0$$

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

16. Explain a Mathematical programming Problem and a Convex programming Problem.

17. Prove that sum of two convex functions is a convex function

18. Write the following LP problem in standard form
Maximize $f(X) = 2x_1 + x_2 - x_3$
Subject to
$2x_1 - 5x_2 + 3x_3 \leq 43x_1 + 6x_2 - x_3 \geq 2x_1 + x_2 + x + 3 = 4x_1 \geq 0, x_3 \geq 0, x_2$ unrestricted

19. Solve graphically
Maximize$3x_1 - 2x_2$

subject to $x_1 + x_2 \leq 1, \quad 2x_1 + 2x_2 \geq 4, \quad x_1, x_2 \geq 0$

20. Solve by simlex method
Maximize $f = 5x_1 + 3x_2$
Subject to
$4x_1 + 5x_2 \leq 105x_1 + 2x_2 \leq 103x_1 + 8x_2 \leq 12x_1 \geq 0, x_2 \geq 0$

21. Use simplex method to solve

Maximize $f = 4x_1 + 3x_2 + 4x_3 + 6x_4$
Subject to
$x_1 + 2x_2 + 2x_3 + 4x_4 \leq 802x_1 + 2x_3 + x_4 \leq 603x_1 + 2x_2 + x_3 + x_4 \leq 80x_1, x_2, x_3, x_4 \geq 0$

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Prove that $f(X) = 2x_1^2 + 2x_2^2 + 4x_3^2 + 2x_1x_2 + 2x_1x_3 + 4x_2x_3$ is a convex function.

23. Solve graphically

Maximize $f = 3x_1 + 4x_2$

Subject to

$4x_1 + 3x_2 \geq 12x_1 + 2x_2 \leq 2x_1 \geq 0, x_2 \geq 0$

24. Solve by two phase simplex method

Maximize $f = 4x_1 + 5x_2$

Subject to

$x_1 - 2x_2 \leq 22x_1 + x_2 \leq 6x_1 + 2x_2 \leq 5 - x_1 + x_2 \leq 2x_1 + x_2 \geq 1x_1 \geq 0, x_2 \geq 0$

25. Solve

Maximize $f = 3x_1 + 4x_2$

Subject to

$4x_1 + 3x_2 \geq 12x_1 + 2x_2 \leq 2x_1 \geq 0, x_2 \geq 0$

(2×15=30)