19103173

Reg No   :   ....

Name   :   ....

B.Sc.DEGREE(CBCS)EXAMINATION, NOVEMBER 2019

First Semester

B.Sc Mathematics Model II Computer Science

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

2017 Admission Onwards

C5EF6AEA

Time: 3 Hours   Maximum Marks :80

Part A

*Answer any **ten** questions.*

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

1. Explain the term span of vectors.

2. Define Eucleadian space

3. Defineδ-neighbourhood of a point.

4. Explain the term convex linear combination of two points.

5. Define convex hull of a set.

6. Define the term convex polyhedron.

7. True or false: Every polytope has a vertex. Justify your answer with an example.

8. Define a Quadratic form and give an example

9. When a quadratic form $f(X) = X'AX$ becomes a convex function?

10. What is the relation between basic feasible solution and vertex of feasible region of an LP problem.

11. Define the term basic feasible solution.

12. Explain Surplus variable in a linear programming problem.

(10×2=20)

Part B

*Answer any **six** questions.*

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

Turn Over

13. Determine whether the set of all 2×2 real matrices is a vector space under regular real number multiplication but with vector addition defined to be matrix multiplication. That is,

$$\mathbf{X} + \mathbf{Y} = \mathbf{XY}$$

14. Solve the following system of homogeneous equations:

$$x_1 + x_2 - 2x_3 + x_4 + 3x_5 = 0$$
$$2x_1 - x_2 + 2x_3 + 2x_4 + 6x_5 = 0$$
$$3x_1 + 2x_2 - 4x_3 - 3x_4 - 9x_5 = 0$$

15. Indicate the following form is positive definite or negative definite

$$4x_1x_2 - x_1^2 - 4x_2^2 - x_3^2$$

16. Classify different types quadratic forms with examples.

17. Prove that sum of two convex functions 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 $x_1 + x_2 \leq 1$, $2x_1 + 2x_2 \geq 4$, $x_1, x_2 \geq 0$

20. Explain Degeneracy in an LP problem.

21. Use simplex method to solve

Maximize $f = x_1 + x_2 + 3x_3$

Subject to

$$3x_1 + 2x_2 + x_3 \leq 3$$
$$2x_1 + x_2 + 2x_3 \leq 2$$
$$x_1, x_2, x_3 \geq 0$$

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Solve graphically

Maximize $f = 5x_1 - x_2$

Subject to

$$x_1 + x_2 \geq 2$$
$$x_1 + 2x_2 \leq 2$$
$$2x_1 + x_2 \leq 2$$
$$x_1 \geq 0, x_2 \geq 0$$

23. Show that the following quadratic form is positive definite

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

24. Solve by Two phase simplex method

Maximize $f = 5x_1 - x_2$

Subject to

$x_1 + x_2 \geq 2$
$x_1 + 2x_2 \leq 2$
$2x_1 + x_2 \leq 2$
$x_1 \geq 0, x_2 \geq 0$

25. Solve

Maximize $f = 5x_1 + 3x_2 + x_3$

Subject to

$2x_1 + x_2 + x_3 = 3$
$-x_1 + 2x_3 = 4$
$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$

(2×15=30)