QP CODE: 23002641

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Reg No : .....

Name : .....

M Sc DEGREE (CSS) EXAMINATION, MARCH 2023

Third Semester

Faculty of Science

CORE - ME010305 - OPTIMIZATION TECHNIQUE

M Sc MATHEMATICS,M Sc MATHEMATICS (SF)

2019 ADMISSION ONWARDS

13C064CA

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Write short note about general problem of mathematical programming.
2. Write a short note on Applications of Duality.
3. *Define general form of ILPP and MILPP.*
4. *Derive Gomory's fractional cut.*
5. Define the following with suitable example.
   (i) Graph (ii) Partial graph (iii) Centre of a graph
6. Explain the term maximum potential difference in a network.
7. Write short note on scheduling sequential activity.
8. Derive Taylor's series.
9. What you mean by perturbation?
10. Write down the Lagrange function and K-T conditions of NLP.
    MInimize $f(x)$ subject to $h_j(x) = 0; j = 1, 2, \ldots, m \; and \; g_j(x) \geq 0; \; j = m+1, m+2, \ldots p$

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. What is mean by multiplier vector and simplex multipliers? Derive a formula for finding it.

12. Write the dual of the following LP problem and verify that the dual of the dual is primal.
Maximize $f(X) = 2x_1 + 3x_2 + x_3$, subject to
$4x_1 + 3x_2 + x_3 \geq 6, x_1 + 2x_2 + 5x_3 \leq 4 \, and \, x_1, x_2, x_3 \geq 0.$

13. *Solve graphically,* $min f(X) = 4x_1 + 5x_2$ *subject to*
$x_1 + x_2 \leq 2, 2x_1 + 3x_2 \leq 6, x_1 + 2x_2 \leq 4, x_1 \geq 0, x_2 \geq 0.$

14. *Define 0-1 problem and hence Explain Selection problem and fixed charge problem using it.*

15. What you mean by goal programming.
A factory can manufacture two products A and B. The profit on a unit of A is Rs. 80 and of B is Rs. 40. The maximum demand of A is 6 units per week and B is 8 units per week. This manufacturer has set a goal of achieving a profit of Rs. 640 per week. Formulate the problem as goal programming and solve it.

16. State and prove maximum flow minimum cut theorem.

17. Express the function$x_1^2 + x_2^2 + x_3^2$ n the form $X'QX$. Is it convex or not?

18. Minimize $f(X) = (x_1 - 2)^2 + (x_2 - 1)^2$ subject $x_1 - 2x_2 - 1 = 0$

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. Solve the following LPP using simplex method
Maximize$f(X) = 4x_1 + 5x_2$
Subject to $x_1 - 2x_2 \leq 2, 2x_1 + x_2 \leq 6, x_1 + 2x_2 \leq 5, -x_1 + x_2 \leq 2, x_1 \geq 0, x_2 \geq 0$

20. *Solve using Branch and Bound method* $Min f(X) = 5x_1 + 4x_2$ *subject to*
$3x_1 + 2x_2 \geq 5, 2x_1 + 3x_2 \geq 7, x_1 \geq 0, x_2 \geq 0$ *are non negative integers.*

21. Find the minimum path from v_1 to v_8

Arc	(1,2)	(1,3)	(1,4)	(2,3)	(2,5)	(2,6)	(3,5)	(3,4)	(4,7)
Length	2	4	10	2	8	8	5	7	9
Arc	(5,6)	(5,8)	(6,3)	(6,4)	(6,7)	(6,8)	(4,6)	(7,3)	(7,8)
Length	2	13	5	2	8	12	0	1	1

22. Maximize the function $f(x) = -3x^2 + 21.6x + 1.0$ with a minimum resolution of $\epsilon = 0.5$ over 6 functional evaluations. The optimal value of $f(x)$ is assumed to lie in the range $25 \geq x \geq 0$.

(2×5=10 weightage)