



22102734

QP CODE: 22102734

Reg No : _____

Name : _____

B.Sc DEGREE (CBCS) REGULAR EXAMINATIONS, AUGUST 2022**Fourth Semester**

B.Sc Mathematics Model II Computer Science

Complementary Course - MM4CMT02 - MATHEMATICS - OPERATIONS RESEARCH - NON LINEAR PR

2020 Admission Only

C1365FCA

Time: 3 Hours

Part A*Answer any ten questions.**Each question carries 2 marks.*

- Using graphical method, list all integer feasible solutions of $\text{Min } x_1 - x_2$ subject to $2x_1 + 3x_2 \leq 6, x_1, x_2 \geq 0$ and x_1, x_2 are integers
- Give the relation between S_F, T_F and $[T_F]$ in Integer Programming Problem.
- Define Branching
- Find a suitable cutting plane for the ILP
 $\text{Max } x_1 + 2x_2$
 $\text{Subject to } 2x_2 \leq 7, x_1 + x_2 \leq 7, 2x_1 \leq 11, x_1 \geq 0, x_2 \geq 0$
- Give an example of a Nonlinear Programming problem.
- Define Lagrangian Function
- State Kuhn-Tucker Theorem
- Find the Lagrangian function for the following problem $\text{Min } x_1 + x_2^2$ Subject to $x_1 + x_2 \leq 4, x_1 \leq 8, x_1, x_2$
- Mark on the graph the set of feasible solutions of
 $(x_1 - 1)(x_2 - 1) \leq 1, x_1 + x_2 \geq 6, x_1, x_2 \geq 0$
- Define Quadratic Programming Problem.
- What assumptions can be made in the minimum of Quadratic Programming Problem if $P \neq 0$ and $X'CX$ is Positive Definite?
- Show that the function $\sin(x_1 + x_2)$ is not separable

Part B*Answer any six questions.**Each question carries 5 marks.*

- By graphical method list all integer feasible solutions of
 $\text{Min } x_1 - x_2$, subject to $x_1 - x_2 \leq 4, x_1 + 4x_2 \leq 4, x_1, x_2$ non-negative integers. Also find the maximum value of $x_1 - x_2$.
- Solve by Branch and Bound Method
 $\text{Maximise } x_1 + 2x_2$ subject to $5x_1 + 7x_2 \leq 21, -x_1 + 3x_2 \leq 8, x_1, x_2$ non negative integers.



15. Using Branch and Bound method, branch the following problem into two sub-problems
 $\text{Max } x_1 + x_2 - 2x_3$ Subject to $x_1 + x_2 + x_3 \leq 5, 3x_1 + 2x_2 - x_3 \leq 6, x_1, x_2, x_3$ are non-negative
16. Explain Branch and Bound Method?
17. Solve graphically $(x_1 - 4)^2 + (x_2 - 3)^2$, Subject to $x_1 + x_2 \leq 5, x_1 + 3x_2 \leq 6, x_1, x_2 \geq 0$
18. Write K-T conditions for Minimise $x_1^2 - x_2^2 - x_2x_3^2$ subject to $x_1^2 + x_2 + x_3 = 3, x_1^2 - 5x_2^2 + x_3 \leq 0, x_1, x_2$
19. Minimise $f = (x_1 + x_2)^2 + (x_2 - 2)^2$ over the region $0 \leq x_1 \leq 2, 0 \leq x_2 \leq 1$, by writing the K-T conditions saddle point.
20. Solve by the method of Quadratic programming minimise
 $-6x_1 + 2x_1^2 - 2x_1x_2 + 2x_2^2$ subject to $x_1 + x_2 \leq 2, x_1, x_2 \geq 0$
21. Solve the following Separable Programming Problem
 $\text{Max } 2x_1^2 + x_2^2$, Subject to $x_1 + x_2 \leq 4, x_1 - 2x_2 \leq 6, x_1, x_2 \geq 0$

Part C

Answer any **two** questions.

Each question carries **15** marks.

22. Solve by cutting plane method
 $\text{Min } x_1 - x_2 - x_3$ subject to $x_1 + x_2 + x_3 \leq 5, x_1 + x_2 + 2x_3 \leq 4, x_1, x_2, x_3$ are non-negative integers
23. Solve the following problem graphically and also by K-T conditions
 $\text{Min } x_1 - x_2$ subject to $x_1 + x_2 \leq 6, x_2 - 3x_3 \leq 3, x_1, x_2 \geq 0$
24. Solve by K-T conditions
 $\text{Max } 4x_1 - 5x_2$ subject to $x_1 + 4x_2 \leq 8, x_1 - 2x_2 \leq 4, x_1, x_2 \geq 0$
25. Solve by the method of Separable programming
Maximise $9 - (x_1 - 3)^2 - (x_2 - 2)^2$ subject to $4x_1^2 + x_2^2 \leq 16, x_1, x_2 \geq 0$