QP CODE: 24020691

24020691

Reg No : .....

Name : .....

B.Sc DEGREE (CBCS) REGULAR EXAMINATIONS, APRIL 2024

Fourth Semester

B.Sc Mathematics Model II Computer Science

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

2017 Admission Onwards

4E5C12FA

Time: 3 Hours

Max. Marks : 80

Part A

*Answer any **ten** questions.*

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

1. Using graphical method, list all integer feasible solutions of $Max\ x_1 + x_2$ subject to $2x_1 + x_2 \leq 6, x_1, x_2 \geq 0$ and x_1, x_2 are intergers
2. Establish the relation between the optimal solutions of
   Minimize $f(X) = CX$
   $subject\ to\ X \in [T_F]\ and\ X \in T_F$
3. What are the disadvantages of cutting plane method?
4. When a problem is said to be pruned?
5. Define Convex programming problem.
6. Define Lagrangian Function.
7. Define primal and dual problems in Nonlinear Programming Problem.
8. Find the Lagrangian function for the following problem
   $Min\ x_1 + x_2^2 + x_3$ Subject to $x_1 + x_2 + x_3 \leq 4, x_1 \leq 8, x_3 \leq 3\ x_1, x_2, x_3 \geq 0$
9. Mark on the graph the set of feasible solutions of
   $(x_1 - 1)(x_2 - 1) \leq 1,\ x_1 + x_2 \geq 6,\ x_1, x_2 \geq 0$
10. What assumptions can be made in the minimum of a Quadratic Programming Problem if P=0 and X^I C X is Positive Semidefinite?
11. What assumptions can be made in the minimum of Quadratic Programming Problem if $P \neq 0$ and $X'CX$ is Positive Definite)?
12. Define separable programming problem.

(10×2=20)

Part B

*Answer any **six** questions.*

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

13. Using cutting plane method , solve
$Min\ 2x_1 - 3x_2$, subject to $x_1 - x_2 \leq 4, x_1 + 3x_2 \leq 6, x_1, x_2$ non-negative integers.

14. Using cutting plane method solve
$Max\ 5x_1 - 2x_2$ subject to $x_1 + x_2 \leq 3, x_1 - 2x_2 \leq 4, x_1, x_2$ are non - negative integers

15. Solve by Branch and Bound Method
Minimize $4x_1+5x_2$ subject to $3x_1+x_2 \geq 2$, $x_1+4x_2 \geq 5$, $3x_1+2x_2 \geq 7$, $x1,x2$ non negative integers

16. Find the initial branches of the problem
Minimize $3x_1 - x_2$ subject to
$-10x_1 + 6x_2 \leq 15, 14x_1 + 18x_2 \geq 63, x_1, x_2$ non negative integers.

17. Solve graphically $(x_1 - 1)^2 + (x_2 - 3)^2$, Subject to $x_1 + 2x_2 \leq 4, x_1 + x_2 \leq 2, x_1, x_2 \geq 0$

18. Write K-T conditions for the problem minimise $\dfrac{3x_1 + x_2 + 3}{x_1 + 2x_2 + 6}$ subject to
$x_1 + 2x_2 \leq 12, 2x_1 - x_2 \leq 4,\ x_1, x_2 \geq 0$

19. Solve by K-T conditions for the LP maximise $3x_1 + 2x_2$ subject to
$2x_1 - x_2 \leq 4, x_1 + x_2 \leq 8, x_1, x_2 \geq 0$

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
$\text{Max}\ x_1^2 + 2x_2^2$, Subject to $2x_1 + x_2 \leq 4, x_1 + 2x_2 \leq 6, x_1, x_2 \geq 0$

(6×5=30)

Part C

*Answer any **two** questions.*

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

22. Solve by Branch and Bound method
$Min\ x_1 - 4x_2$ subject to $x_1 + 2x_2 \leq 5, x_1 + 5x_2 \leq 10, x_1, x_2$ are non-negative integers

23. Solve by K-T conditions maximise $2x_1 - x_1^2 + x_2$ subject to
$2x_1 + 3x_2 \leq 6, 2x_1 + x_2 \leq 4, x_1, x_2 \geq 0$

24. Solve by K-T conditions minimise
$16(x_1 - 2)^2 + (4x_2 - 9)^2$
subject to $x_1 - x_2^2 \geq 0, x_1 + x_2 \leq 6, x_1, x_2 \geq 0$

25. Solve by the method of Separable programming
Maximise $9 - (x_1 - 3)^2 - (x_2 - 2)^2$ subject to $4x_1^2 + x_2^2 \leq 16, x_1, x_2 \geq 0$

(2×15=30)