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Reg. No.....

Name.....

M.Sc. DEGREE (C.S.S.) EXAMINATION, FEBRUARY 2021

Third Semester

Faculty of Science

Branch I-(A)—Mathematics

MT 03C 15—OPTIMIZATION TECHNIQUES

(2012—2018 Admissions)

Time : Three Hours Maximum Weight : 30

Part A

Answer any **five** *questions.*

Each question carries weight 1.

1. Explain : (a) Pure integer problem ; (b) Mixed integer Problem ; and (c) Applications of ILP.
2. What are the steps involved in integer programming algorithms.
3. Explain the procedure of sensitivity analysis. What are its two cases ?
4. Define (i) Centre of a graph ; and (ii) Spanning tree. Give examples.
5. Explain (i) Zero sum game ; and (ii) Value of the game.
6. State the fundamental theorem of rectangular game.
7. How does integer programming differ from linear programming ?
8. Explain the term golden ratio.

(5 × 1 = 5)

Part B

Answer any **five** *questions.*

Each question carries weight 2.

9. Discuss the two different methods of ILP.
10. Explain : (i) Fathomed subproblem ; (ii) Pruned sub-problem ; and (iii) Use of 0-1 variables.

Turn over

11. State and prove max-flow min-cut theorem.

12. Explain how to schedule sequential activities.

13. Solve :

$$\begin{array}{cc} & \textit{Player B} \\ & \begin{array}{ccc} B_1 & B_2 & B_3 \end{array} \\ \textit{Player A} \begin{array}{c} A_1 \\ A_2 \\ A_3 \end{array} & \begin{pmatrix} 1 & 3 & 1 \\ 0 & -4 & -3 \\ 1 & 5 & -1 \end{pmatrix} \end{array}$$

14. Solve graphically $\begin{pmatrix} 1 & -3 & 7 \\ 2 & 4 & -6 \end{pmatrix}$.

15. By Golden search method :

Maximise $f(x) = x^4 - 15x^3 + 72x^2 - 1135x$ in the range $1 \le x \le 15$.

16. State Hooke and Jeeves search algorithm.

$(5 \times 2 = 10)$

Part C

Answer any **three** *questions.*
Each question carries weight 5.

17. Solve by cutting plane algorithm :

Maximize $x_1 + x_2$

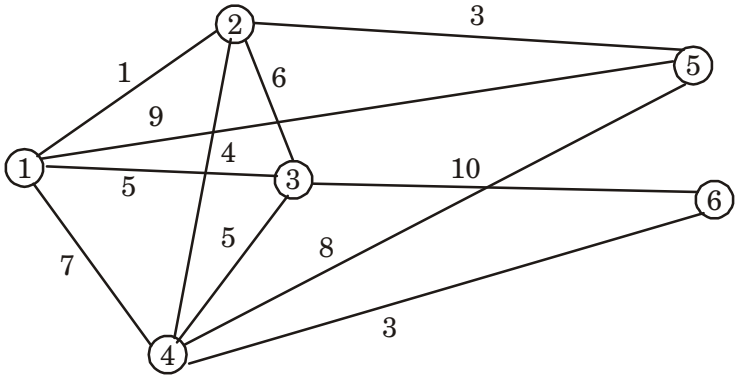
subject to $2x_1 \le 3$

$2x_1 + 2x_2 \ge 5$

$-2x_1 + 2x_2 \le 1$

x_1, x_2 non-negative integral.

18. Obtain the minimal spanning tree :



19. Write the algorithm to solve a generalised problem of maximum flow.

20. Solve the following game by LPP :

$$\begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \end{array} \begin{array}{c} \begin{array}{ccc} B_1 & B_2 & B_3 \end{array} \\ \begin{pmatrix} 3 & -1 & -3 \\ -2 & 4 & -1 \\ -5 & -6 & 2 \end{pmatrix} \end{array}.$$

21. Write Kuhn-Tucker conditions to :

Maximize $f(x) = x_1^3 - x_2^2 + x_1 \cdot x_3^2$

subject to $x_1 + x_2^2 + x_3 = 5$

$5x_1^2 - x_2^2 - x_3 \geq 0$

$x_1, x_2, x_3 \geq 0$ and solve.

Turn over

22. Minimize $Z = x_1^2 + x_2^2 + x_3^2$

subject to $4x_1 + x_2^2 + 2x_3 - 14 = 0$

using Lagrange method of multiplier.

$(3 \times 5 = 15)$