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PG CBCS M.SC. Semester-III Examination, 2021 DEPARTMENT OF MATHEMATICS PAPER: MTM-305B

(ADVANCED OPTIMIZATION AND OPERATIONS RESEARCH)
Full Marks: 50 Time: 2 Hours

Answer any <u>FOUR</u> questions from the following: 10×4=40

- 1. a) Define goal programming problem.
 - b) Solve the following goal programming problem
 - $\begin{array}{l} \text{Minimize } z = P_1 d_1^- + P_2 (2d_2^- + 3d_3^-) \\ \text{subject to} \quad 20x_1 + 10x_2 \leq 60 \\ 10x_1 + 10x_2 \leq 40 \\ 40x_1 + 80x_2 + d_1^- d_1^+ = 600 \\ x_1 + d_2^- d_2^+ = 2 \\ x_2 + d_3^- d_3^+ = 2 \\ x_1, x_2, d_i^-, d_i^+ \geq 0, i = 1, 2, 3 \end{array}$
- 2. a) Solve using revised simplex method the following LPP

Maximize
$$z = 3x_1 + 5x_2$$

subject to $x_1 \le 4$
 $x_2 \le 6$
 $3x_1 + 2x_2 \le 18$
 $x_1, x_2 \ge 0$

b) What is 'Golden ratio'?

8+2

3. a) Minimize $f(x) = \begin{cases} 2\sqrt{x}, & x \le 1 \\ 3-x, & x > 1 \end{cases}$ in the interval [0, 4] by Fibonacci method using n = 7.

b) Explain the concepts of deviational variables in goal programming problems. 7+3

4. a) Explain the effect of deletion of an existing variable from the optimal result of an LPP.

[P. T.O]

b) Solve the following IPP using branch and bound method

$$\begin{array}{l} Maximize \; z = 2x_1 + 3x_2\\ subject \; to \; 6x_1 + 5x_2 \leq 25\\ x_1 + 3x_2 \leq 10\\ x_1, x_2 \geq 0 \; and \; integers \end{array} \qquad 2{+}8 \end{array}$$

5. a) Is it possible to obtain the optimal integer solution of an IPP after neglecting integer restrictions and round-off the optimal solution of the corresponding LPP? Justify.

b) Derive the conditions of the range of discrete changes of the component of cost vector of the LPP

$$\begin{aligned} Maximize \ Z &= CX\\ \text{subject to } AX &= b\\ \text{and } X &\geq 0 \end{aligned}$$

such that the optimal solution does not alter. 3+7

6. a) Solve by using modified dual simplex method

Maximize
$$z = 2x_1 - 3x_2 - 2x_3$$

subject to $x_1 - 2x_2 - 3x_3 = 8$
 $2x_2 + x_3 \le 10$
 $x_2 - 2x_3 \ge 4$
 $x_1, x_2, x_3 \ge 0$

b) Write the differences between revised simplex and dual simplex method.

8+2

- 7. a) What are the basic differences between analytical and numerical optimization methods?
 - b) Using Davidon-Fletcher-Powell method minimize $f(x_1, x_2) = x_1^2 + 2x_2^2 + x_1 2x_2$ starting from the point $\binom{1}{0}$. 2+8
- 8. a) Write down the procedure of Golden section method.b) Given the LPP

Maximize
$$z = -x_1 + 2x_2 - x_3$$

subject to $3x_1 + x_2 - x_3 \le 10$
[P.T.O]

$$-x_1 + 4x_2 + x_3 \ge 6$$

 $x_2 + x_3 \le 4$
 $x_1, x_2, x_3 \ge 0$

Determine the ranges for discrete changes of the first components of b so as to maintain the optimality of the current optimal solution for the LPP.

4+6

[Internal Assessment- 10 Marks]