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PG CBCS

M.Sc. Semester-III Examination, 2020

MATHEMATICS

PAPER: MTM 305B

ADVANCED OPTIMIZATION AND OPERATIONS RESEARCH

Full Marks: 40 **Time: 2 Hours**

Answer any <u>four</u> questions: **10X4=40**

1. Solve the LPP by Revised Simplex method

$$Max. Z = 6x_1 - 2x_2 + 3x_3$$
$$\text{s.t.} \quad 2x_1 - x_2 + 2x_3 \leq 2$$
$$x_1 + 4x_3 \leq 4$$
$$x_1, x_2, x_3 \geq 0.$$

10

2. (a) Write the procedure of Golden section method to optimize an unimodal minimization problem.

(b) Write the working procedure of the Branch and Bound method to solve an IPP.

5+5

3. (a) What are the initial criteria to apply dual simplex method and what is the achievement of this method?

(b) Solve the following LPP by artificial constraint method

$$Min. \quad z = x_1 - x_2$$
$$\text{s. t. } 2x_1 + x_2 \geq 2$$
$$-x_1 - x_2 \geq 1$$
$$\text{and } x_1, x_2 \geq 0.$$

2+8

4. (a) Write the steps of Davidon-Fletcher-Powell method to solve a non-linear optimization problem.

(b) Using steepest descent method

Min.$f = x_1^2 + x_2^2 + x_3^2 + 8x_1 + 10x_2 + 4x_3 + 50$

starting from the point $\begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$.

4+6

5. Define goal programming problem. A firm produces two products A and B. Each product must be processed through two departments namely 1 and 2. Department 1 has 30 hours of production capacity per day, and department 2 has 60 hours. Each unit of

product A requires 2 hours in department 1 and 6 hours in department 2. Each unit of product B requires 3 hours in department 1 and 4 hours in department 2. Management has established the following goals it would like to achieve in determining the daily product mix:

P_1: The joint total production at least 10 units.

P_2: Producing at least 7 units of product B.

P_3: Producing at least 8 units of product A.

Formulate this problem as a goal programming model. 4+6

6. Using Fibonacci method $Min\ f(x) = \begin{cases} \frac{2x}{3} + 1, & x \leq 3 \\ 6 - x, & x > 3 \end{cases}$

   in the interval [0, 5] taking n=5. 10

7. Given LPP is

$$Max. Z = 2x_1 + x_2 + 3x_3$$

$$\text{s.t.} \quad x_1 + x_2 + 2x_3 \leq 5$$

$$2x_1 + 3x_2 + 4x_3 = 12$$

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

   Determine the ranges for discrete changes in the components b_1 and b_2 of the requirement vector so as maintain the optimality of the current optimal solution. 10

8. What is Integer Programming problem? Use Branch and Bound technique to solve the LPP.

$$Max\ Z = 7x_1 + 9x_2$$

$$\text{s. t.} \quad -x_1 + 3x_2 \leq 6$$

$$7x_1 + x_2 \leq 35$$

$$0 \leq x_1, x_2 \leq 7$$

x_1, x_2 are integers. 10

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