Total pages: 02

PG CBCS

M.SC. Semester-III Examination, 2022

MATHEMATICS

PAPER: MTM 305B

(ADVANCED OPTIMIZATION AND OPERATIONS RESEARCH)

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

The figures in the right-hand margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

1. Answer any <u>FOUR</u> questions from the following: **4×2=8**

a) Define goal programming problem.

b) Write the advantages of revised simplex method.

c) Write the limitations of Fibonacci searching method.

d) Write the condition when we have to apply dual simplex method to solve an LPP?

e) State the integer and mixed integer programming problem.

f) Explain the deletion of an existing variable from the optimal table of an LPP.

2. Answer any <u>FOUR</u> questions from the following: **4×4=16**

a) Following is the optimal table of an LPP

		c_j	7	9	0	0
c_B	B	x_B	y_1	y_2	y_3	y_4
9	x_2	$\frac{7}{2}$	0	1	$\frac{7}{22}$	$\frac{1}{22}$
7	x_1	$\frac{9}{2}$	1	0	$-\frac{1}{22}$	$\frac{3}{22}$
$z_j - c_j$			0	0	$\frac{28}{11}$	$\frac{15}{11}$

Find range of discrete changes of c_1 and c_2 such that the optimal solution does not alter.

b) 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.

c) 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.T.O.]

P_1: Producing at least 7 units of product B.
P_2: Producing at least 8 units of product A.
Formulate above goal programming problem.

d) Write the steps of Davidson-Fletcher-Powell method.

e) Maximize $f(x) = \begin{cases} 2x/3, & x \leq 3 \\ 5-x, & x > 3 \end{cases}$ in the interval $[0,4]$ by Golden Section method using $n = 4$.

f) Using Newton's method Minimize $f(x_1, x_2) = 8 + x_1 - 4x_1^2 + 2x_1x_2 - 6x_2^2$ with $\binom{1}{0}$ as a starting point.

3. Answer any <u>TWO</u> questions from the following: **2×8=16**

a) Solve the following IPP using branch-and-bound method

$$\begin{aligned} &Maximize\ z = 2x_1 + 2x_2 \\ &subject\ to\ 5x_1 + 3x_2 \leq 8 \\ &x_1 + 2x_2 \leq 4 \\ &x_1, x_2 \geq 0\ and\ are\ integers \end{aligned}$$

b) Solve the following goal programming problem

$$\begin{aligned} &Minimize\ z = P_1 d_6^+ + P_2(1d_2^- + 2d_3^-) + P_3 d_1^- \\ &subject\ to\ \ 20x_1 + 10x_2 + d_4^- - d_4^+ = 60 \\ &10x_1 + 10x_2 + d_5^- - d_5^+ = 40 \\ &40x_1 + 80x_2 + d_1^- - d_1^+ = 1000 \\ &x_1 + d_2^- - d_2^+ = 4 \\ &x_2 + d_3^- - d_3^+ = 6 \\ &d_4^+ + d_5^+ + d_6^- - d_6^+ = 50 \\ &x_1, x_2, d_i^-, d_i^+ \geq 0, i = 1,2,3,4,5,6 \end{aligned}$$

c) Using cutting plane method, solve

$$\begin{aligned} &Maximize\ f = 7 - 2x_1 - 4x_2 \\ &subject\ to\ (x_1 - 4)^2 + 2(x_2 - 3)^2 - 12 \leq 0 \\ &x_1 + 2x_2 - 6 \leq 0 \\ &1 \leq x_1, x_2 \leq 6 \end{aligned}$$

With the tolerance $\epsilon = 0.03$

d) Minimize $f(x) = \begin{cases} 2\sqrt{x}, & x \leq 1 \\ 3-x, & x > 1 \end{cases}$ in the interval $[0,4]$ by Fibonacci method using $n = 7$. 6+2

*****