2017

M.Sc.

3rd Semester Examination

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

PAPER—MTM-305(OR)

Full Marks : 50

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.

Illustrate the answers wherever necessary.

(Advanced Optimization and Operations Research)

Answer *Q. No. 1* and any *four* questions from the rest.

1. Answer any *four* questions : 4×2

   (a) What is artificial constraint ?

   (b) Define goal programming problem.

   (c) Write the Kuhn-Tucher necessary conditions for the problem

Maximize $f = f(x_1, x_2, \ldots, x_n)$

Subject to $g_j(x_1, x_2, \ldots, x_n) \leq b_j,\ j = 1,2,\ldots,m$

(d) Find the conjugate directions for the matrix $\begin{pmatrix} 4 & 5 \\ 5 & 4 \end{pmatrix}$.

(e) What is the initial criteria to apply revised simplex method and what is the achievement of this method ?

(f) What are the difference between analytical methods and numerical methods for optimization problem ?

2. Use modifed simplex method to solve the following goal programming problem

Min. $Z = P_1 d_1^- + P_2(2d_2^- + d_3^-) + P_3 d_1^+$

Subject to the constraints

$$x_1 + x_2 + d_1^- - d_1^+ = 400$$
$$x_1 + d_2^- - d_2^+ = 240$$
$$x_2 + d_3^- - d_3^+ = 300$$

and $x_1, x_2, d_i^+, d_i^- \geq 0,\ i = 1,2,3.$ 8

3. What are the limitations of Golden section method ? Write down the procedure of Golden section search method to find the interval of uncertainty of the maximization problem. 2+6

4. Solve the following problem using branch-and-bound method.

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. 8

5. Using cutting plane method, solve

Maximize $f(x_1, x_2) = 7 - 2x_1 - 4x_2$

Subject to $(x_1 - 4)^2 + 2(x_2 - 3)^2 \leq 12$

$x_1 + 2x_2 \leq 6$

$1 \leq x_1 \leq 6$

$1 \leq x_2 \leq 6$

With tollerence $\varepsilon = 0.03$. 8

6. Solve the following LPP using revised simplex method.

Maximize $Z = 3x_1 + 5x_2$

Subject to $x_1 \leq 4$

$x_2 \leq 6$

$3x_1 + 2x_2 \leq 18$

and $x_1, x_2 \geq 0$ 8

7. The optimal table of the following LPP

Maximize $Z = 2x_1 + 2x_2$

Subject to $5x_1 + 3x_2 \leq 8$

$x_1 + 2x_2 \leq 4$

and $x_1, x_2 \geq 0$

is

C_X	Y	X_B	y_1	y_2	y_3	y_4
2	x_1	4/7	1	0	2/7	-3/7
2	x_2	12/7	0	1	-1/7	5/7
$Z_j - C_j$			0	0	2/7	4/7

Find the modified optimal results of the problem when a new variable x_5 is introduced in the above problem with the following data :

(i) $a_5 = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$ and $c_5 = 1$.

(ii) $a_5 = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$ and $c_5 = 3$. 2+6

[Internal Assessment—10 Marks]

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