PG (NEW) CBCS

M.Sc. Semester-III Examination, 2019

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

PAPER: MTM- 305B

SPECIAL PAPER-OR

(ADVANCED OPTIMIZATION AND OPERATIONS RESEARCH)

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

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1. Answer any four questions of the following: **2×4=8**

i) What is the criteria to apply revised simplex method for solving an LPP?

ii) Define integer programming problem. Give a real example of it.

iii) Give an example showing that we may not get the optimal solution of IPP just rounding off the optimal solution of the corresponding LPP.

iv) In Golden section method why it is called Golden section?

v) Define quadratically convergent method and A-conjugate directions.

vi) Using algebraic approach show that the expression $ax + \frac{b}{x} + c; a, b > 0$ has minimum value $2\sqrt{ab} + c$ *at* $x = \sqrt{b/a}$.

vii) What are the differences between analytical methods and numerical methods for optimization problem?

viii) What is the importance of post optimality analysis?

2. Answer any four questions of the following: **4×4=16**

i) *Maximize* $f(x) = \begin{cases} 2x/3, & x \leq 3 \\ 5 - x, & x > 3 \end{cases}$ in [1,4] by Golden section method upto 4 experiments.

ii) Prove that f(X) increases at the fastest rate in the direction of ∇f.

(Turn over)

iii) Following is the optimal table of an LPP

		c_j	2	1	1	2	0
c_B	B	x_B	y_1	y_2	y_3	y_4	y_5
2	x_1	3	1	0	-1	3	2
1	x_2	4	0	1	4	-1	-2
$z_j - c_j =$		10	0	0	1	3	2

Find the optimal solution to the problem if c_3 is changed to 3.

iv) When required an artificial constraint method to solve an LPP. Explain it with an example.

v) Define Unimodal function. Write down the limitations of the Fibonacci method. **1+3=4**

vi) $Minimize\ f(x) = \frac{|x-3|}{2}$ in the interval [0,5] by Golden section method upto 4 experiments.

vii) Write the steps of Davidson-Fletcher-Powell method to solve a non-linear optimization problem.

viii) Discuss the discrete change in the cost vector when the change occurs for for basis variable.

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

i) Solve the following LPP by revised simplex method

$$Minimize\ z = 2x_1 + x_2$$

Subject to constraints

$$3x_1 + x_2 \leq 3$$
$$4x_1 + 3x_2 \geq 6$$
$$x_1 + 2x_2 \leq 3$$
$$x_1, x_2 \geq 0$$

ii) Use modified simplex method to solve the following goal programming problem

$$Minimize\ z = p_1 d_1^- + p_2(2d_2^- + d_3^-) + p_3 d_1^+$$

Subject to constraints

$$x_1 + x_2 + d_1^+ - d_1^- = 400$$
$$x_1 + d_2^- - d_2^+ = 240$$
$$x_2 + d_3^- - d_3^+ = 300$$
$$x_1, x_2, d_i^+, d_i^- \geq 0,\ \ i = 1,2,3$$

iii) Solve using steepest descent method $Minimize\ f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ starting from the pt. $\begin{bmatrix}0\\0\end{bmatrix}$.

iv) Using cutting plane method, solve

$$Maximize\ f = 7 - 2x_1 - 4x_2$$

Subject to constraints

$$(x_1 - 4)^2 + 2(x_2 - 3)^2 - 12 \leq 0$$
$$x_1 + 2x_2 - 6 \leq 0$$
$$1 \leq x_1, x_2 \leq 6$$

With the tolerance $\epsilon = 0.03$.

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