MA/MSCMT-10

December - Examination 2017

M.A./M.Sc. (Final) Mathematics Examination

Mathematical Programming

Paper - MA/MSCMT-10

Time : 3 Hours] **[Max. Marks :- 80**

Note: The question paper is divided into three sections A, B and C.

Section - A **8 × 2 = 16**

(Very Short Answer Type Questions)

Note: Section 'A' contain 08 very short Answer Type Questions. Examinees have to attempt all questions. Each question is of 02 marks and maximum word limit is thirty words.

1) (i) Define Quadratic form.

(ii) What is Basic Feasible Solution.

(iii) Define constrained optimization problem and unconstrained optimization problem.

(iv) State the difference between all integer programming problem and mixed integer programming problem.

(v) Define Convex programming problem.

(vi) State Bellman's principle of Optimality.

(vii) Define bounded variable problem.

(viii)Write quadratic form

$$Q(x) = x_1^2 + 2x_2^2 - 7x_3^2 - 4x_1x_2 + 6x_1x_3 - 5x_2x_3 \text{ in matrix form.}$$

Section - B **4 × 8 = 32**

(Short Answer Type Questions)

Note: Section 'B' contain 08 short Answer Type Questions. Examinees will have to answer any four (04) question. Each question is of 08 marks. Examinees have to delimit each answer in maximum 200 words.

2) Show that $f(x) = x^2$ is a convex function.

3) Find the dimension of a rectangular parallelepiped with largest volume whose sides are parallel to the coordinate planes, to be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$

4) Use Lagrange's multiplier method, solve the following nonlinear programming problem:

Minimize $f(X) = 2x_1^2 2x_2^2 + 2x_3^2 - 24x_1 - 8x_2 - 12x_3 + 10$

subject to $x_1 + x_2 + x_3 = 11$; $x_1, x_2, x_3 \geq 0$

5) Use Kuhn Tucker condition solve the following nonlinear programming problem:

Max $f(x) = 8x - x^2$ subject to $x \leq x$; $x \geq 0$.

6) Explain Primal function and Dual function in nonlinear programming.

7) Give the steps involved in separable programming problem.

8) Solve by Dynamic programming : Max $z = 8x_1 + 7x_2$ s.t.

$2x_1 + x_2 \le 8\,;\, 2x_1 + 2x_2 \le 15\,;\, x_1, x_2 \ge 0$

9) Prove that the set of all optimum solutions (global maximum) of the general convex programming problem is a convex set.

Section - C **2 × 16 = 32**

(Long Answer Type Questions)

Note: Section 'C' contain 04 Long Answer Type Questions. Examinees will have to answer any two (02) questions. Each question is of 16 marks. Examinees have to delimit each answer in maximum 500 words. Use of non-programmable scientific calculator is allowed in this paper.

10) Solve the following Ipp by standard form II revised simplex method:

Min $z = x_1 = 2x_2$ $\quad 2x_1 + 5x_2 \ge 6\,;\, x_1 + x_2 \ge 2\,;\, x_1\,,\, x_2 \ge 0$

11) Solve the following quadratic programming using wolfe's method:

Minimize $f\,(x_1, x_2) = x_1^2 + 2x_2^2 - 8x_1 - 10x_2$ s.t.

$x_1 + x_2 \le 5\,;\, x_1 + 2x_2 \le 8\,;\, x_1, x_2 \ge 0$

12) Solve the integer programming problem: Max $z = 7x_1 + 9x_2$ s.t.

$-x_1 + 3x_2 \le 6\,;\, 7x_1 + x_2 \le 35\,;\, x_1, x_2 \ge 0$ and $x_1\,,\, x_2$ are integers.

13) Solve the following Ipp by Branch and Bound technique Max $z = x_1 + x_2$ s.t.

$3x_1 + 2x_2 \le 12\,;\, x_2 \le 2\,;\, x_1, x_2 \ge 0$ and $x_1\,,\, x_2$ are integers.