2022

APPLIED MATHEMATICS WITH OCEANOLOGY AND COMPUTER PROGRAMMING

[P.G.]

(M.Sc. Fourth SemesterEnd Examination-2022)

PAPER-MTM 404B

Full Marks: 50 ***Time: 02 Hrs***

The figures in the right hand margin indicate marks
Candidates are required to give their answers in their own words as far as practicable
Illustrate the answers wherever necessary

[Special Paper – OR]
[Nonlinear Optimization]

Answer question No 1 and any four

1. Answer any four **4x2= 8**

   a) Define bi-matrix game with an example.

   b) Write the advantage of Geometric programming.

   c) What do you mean by complementary stackness condition concerning a wolfe's method.

   d) State slater's constraint qualification.

   e) What is stochastic programming problem? Who first defined chance constant program technique and in which year.

   f) What do you mean by quadratic programming?

2. a) Let X be an open set in R^n and θ and g be differential and convex on X and let $\bar{x}$ solve the minimization problem and let g satisfy the Kuhn-Tucker constant qualification. Show that there exists a $\bar{u} \in R^m$ such that $(\bar{x}, \bar{u})$ solves the dual maximization problem and $\theta(\bar{x}) = \psi(\bar{x}, \bar{y})$

   b) Prove that all strategically equivalent bimatrix game have the Nash equilibria. 5+3

3. When solve the problem minimize

   $Z_x = 7x_1x_2^{-1} + 3x_2x_3^{-2} + 5x_1^{-3}x_2x_3 + x_1x_2x_3$

   and $x_1, x_2, x_3 \geq 0$ by geometric programming problem. 8

4. Solve the non-linear programming problem given below :

   Optimize $Z = x_1^2 + x_2^2 + x_3^2$

   Subject to $x_1 + x_2 + 3x_3 = 2$

   $5x_1 + 2x_2 + x_3 = 5$

   $x_1, x_2, x_3 \geq 0$ 8

5. a) State and prove Fritz-john saddle point sufficient optimality theorem. What are the basic differences between the necessary criteria and sufficient criteria of FJSP.

   b) Define the Minimization problem 6+2

6. a) How do you solve the following geometric programming problem?

   Find $X = \begin{Bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{Bmatrix}$ that minimizes the objective function

   $$f(x) = \sum_{j=1}^{n} U_j(x) = \sum_{j=1}^{n}\left(c_j \prod_{i=1}^{n} a_{ij}\right)$$

   $c_j > 0, x_i > 0, a_{ij}$ are real numbers $\forall i, j$

   b) Derive the Khun-Tucker conditions for quadratic programming problem. 5+3

7. Solve the following problem by Beale's method

   Max $Z = 10x_1 + 25x_2 - 10x_1^2 - x_2^2 - 4x_1x_2$

   Subject to $x_1 + 2x_2 + x_3 = 10$

   $x_1 + x_2 + x_4 = 9$

   $x_1, x_2, x_3, x_4 \geq 0$

Internal Assessment –10
