RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree
Third Year – Semester II Examination– April/May 2016

MAT 3217 – Non Linear Programming

Answer four questions only. ***Time allowed: Two Hours***

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1. Briefly explain the Lagrange multiplier Method.

   a) The Hickory cabinet and Furniture Company makes chairs. The fixed cost per month of making chairs is $ 7500 and the variable cost per chair is $40. Price is related to demand according to the following linear equation;

   $$v = 400 - 1.2p$$

   (i). Develop the nonlinear profit function for this company.

   (ii). Determine the price that will maximize profit, the optimal volume and the maximum profit per month.

   (iii). Graphically illustrate the profit curve developed in part (i). Indicate the optimal price and the maximum profit per month.

   A farmer wishes to fence off a rectangular pasture along the bank of a river. The area of the pasture is to be $3200m^2$ and no fencing is needed along the river bank. Find the dimensions of the pasture that will require the least amount of fencing.

2. Consider the following problem.

   Minimize $z = 2x_1^2 + 2x_2^2 + 3x_3^2 + 2x_1x_2 + 2x_2x_3 + x_1 - 3x_2 - 5x_3$

Subject to

$x_1 + x_2 + x_3 \geq 1$

$3x_1 + 2x_2 + x_3 \leq 6$

$x_1, x_2, x_3 \geq 0$

Show that z is strictly convex and then solve the problem using the quadratic programming algorithm.

3.

(i) Briefly explain the initialization ,iteration steps and stopping rule of the gradient search procedure,

(ii) Starting from the initial trail solution$(\boldsymbol{x_1, x_2}) = \boldsymbol{(1, 1)}$,apply the gradient search procedure to solve the following problem.

$$\boldsymbol{Max\, f(x) = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2}$$

Use an error tolerance $\boldsymbol{\varepsilon = 0.25}$

4.

(i) Explain the **Geometric programming method**.

(ii) Solve the following problem by geometric programming

Minimize $z = 2x_1^2x_2^{-3} + 8x_1^{-3}x_2 + 3x_1x_2$

$x_1, x_2 \leq 0$

5. Consider the problem.

Maximize $z = 6x_1 + 3x_2 - -4x_1x_2 - 2x_1^2 - 3x_2^2$

Subject to

$x_1 + x_2 \leq 1$

$2x_1 + 3x_2 \leq 4$

$x_1, x_2 \leq 0$

Show that z is strictly concave and then solve the problem using the quadratic programmin algorithm.

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