CHUKA **UNIVERSITY**

COLLEGE

UNIVERSITY EXAMINATIONS

**SECOND YEAR EXAMINATION FOR THE AWARD OF DEGREE OF
BACHELOR OF SCIENCE IN AGRIBUSINESS MANAGEMENT**

ECON 232: MATHEMATICS FOR ECONOMISTS

STREAM: B.SC(AGBM) Y2S1   **TIME: 2 HOURS**

DAY/DATE: TUESDAY 27/7/2010   **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS

Answer question One and any other two questions.
Do not write on the question paper.

1.   (a)   Compute the following:

        (i) $\text{Log}_5 \left(\sqrt{5^{10}}\right)\left(5^{-2}\right)$ [3 marks]

        (ii) $\left(\dfrac{x^{-\frac{1}{3}}}{x^{-\frac{2}{3}}}\right)$ [3 marks]

        (iii) $(a+b)^7$ [3 marks]

    (b)   (i)   What is an economic model?   [1 mark]

(ii)   Consider the following national income model for an economy with no external trade.

$$Y = C + I + G$$

Where:

$$C = 120 + 0.8Y$$

$$G = 40$$

Find   (a)   Equilibrium income   [2 marks]

         (b)   Equilibrium consumption   [2 marks]

(iii)   Find the equilibrium price and quantity for the following market model.

$$Q_d = \frac{16}{P}$$

$$Q_S = 2P^2$$

(c)   The average total costs of a firm is given by:

$$ATC = \alpha_1 Q^2 - \alpha_2 Q + \beta_1 + \frac{\beta}{Q}.$$

Determine

(i)   The total cost function for the firm.   [2 marks]

(ii)   The fixed cost function for the firm.   [2 marks]

(iii)   The average variable and the average fixed functions for the firm.   [2 marks]

(iv)   Sketch the graph of the average fixed cost function. [1 mark]

(d)   You are provided with the following TR and TC functions.

$$TR = AQ - bQ^2$$
$$TC = F + dQ$$

(i)   Determine the profit function.   [1 mark]

(ii)   If a = 9, b = 2, d = 2 and F = 3, Find the level of Q for which
        profits are zero.   [2 marks]

(e)   Find $\dfrac{dy}{dx}$ for the function $y = (4x)^3$ [3 marks]

Q.2   (a)   Consider the production function:

$$Q = AL^\alpha \quad 0 < \alpha \ 1^: \ A > 0$$

(i)   Find the MPL   [2 marks]

(ii)   Express MPL in terms of α , L and Q.   [2 marks]

(iii)   Determine the slope of MPL.   [2 marks]

(iv)   What is the sign of the slope of MPL?   [2 marks]

(v)   Determine whether MPL increases, diminishes or
        remains constant as L increases.   [2 marks]

(b)   Consider the following function:

$$h(x) = \tfrac{1}{3}x^3 + x^2 - 35x + 10$$

Determine the critical values and find out whether these critical values
are maxima or minima. Determine the extreme values of the function.
                                                                         [10 marks]

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Q.3   (a)   Consider the following utility function:

$$U = 25x^{\frac{2}{5}} y^{\frac{3}{5}}$$

(i)   (a)   Find the MUx and MUy   [6 marks]

(b)   From your results, find the MRCS between the two goods.
                                                                    [3 marks]

(ii)   (a)   By setting U = 100, derive the corresponding indifference
              curve.   [2 marks]

(b)   Find the MRCS for $x = 2$.   [2 marks]

(c)   Does the indifference curve obey the Law of diminishing
       MRCS?   [1 mark]

(b)   Find the MPC and MPS for the following function:

       S = -150 + 0.25Y   [3 marks]

(c)   You are given the following information regarding demand and supply
       functions:

              Demand function

              4P + 2Q − 40 = 0

              Supply function

              $P = 2Q^2 + 4Q + 2$

       Determine:

       (i)   The marginal revenue function.   [2 marks]

       (ii)   The marginal revenue at Q = 10   [1 mark]

4. (a) The commodity and money markets for an economy are defined by the following equations:

Commodity market

$Y = C + I$
$C = 200 + \frac{2}{5} Y$
$I = 1900 - 12r$

Money market

$M_{DT} = \frac{1}{2} Y$

$M_{DS} = 100 - 10r$

$M_S = 1500$

(i) Derive the IS and LM function for the economy.   [2 marks]

(ii) What is the equilibrium income and rate of interest for the economy?   [3 marks]

(b) Write short notes on the following:

(i) Local maxima and minima.   [3 marks]

(ii) Global maxima and minima.   [3 marks]

(iii) End point extrema.   [3 marks]

(c) Determine the derivatives of:

(i) $y = 3x^2 \left(4x^3 + x^2 \right)$ [2 marks]

(ii) $y = 2x^{\frac{3}{4}} - 3x^{\frac{2}{3}} + 16$ [2 marks]

(iii) $\dfrac{x^{\frac{1}{3}}}{2 + x^5}$ [2 marks]