CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE (ECONOMICS AND STATISTICS, BACHELOR OF ARTS (ECONOMICS AND MATHEMATICS, BACHELOR OF ARTS (ECONOMICS AND SOCIOLOTY AND BACHELOR OF ARTS (ECONOMICS AND HISTORY)

ECON 131: INTRODUCTIN TO MATHEMATICS FOR ECONOMICS

STREAMS: BSC (ECON & STAT), BA (ECON & MATHS), BA (ECON & SOCI), BA (ECON & HIST) **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 06/12/2017 **8.30 A.M. – 10.30 A.M.**

INSTRUCTIONS: ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE

(a) Expand the following summations:

(i) $\sum_{I=0}^{3} k_i x_i$ [2 marks]

(ii) $\sum_{i=0}^{3} 5x^{i}$ [2 marks]

(iii) $\sum_{i=0}^{2} 6\left(x_i - y_i\right)$ [2 marks]

(iv) $\sum_{i=1}^{2} \sum_{5=1}^{2} x_i y_i$ [2 marks]

(v) $\sum_{i=1}^{2} \sum x_{ij}$ [2 marks]

(b) Solve the following quadratic equations and state the type of root emerging from your computations.

(i) $x^2 + 7x + 6 = 0$ [2 marks]

(ii) $x^2 + 3x + 2\frac{1}{2} = 0$ [2 marks]

(iii) $2x^2 + 5x + 8 = 0$ [2 marks]

(c) Compute the following limits

(i) $\lim_{x \to 2} \left[\frac{x^4}{x+2}\right]$ [2 marks]

(ii) $\lim_{x \to 5} [x^2 + 5](x - 2)$ [2 marks]

(iii) $\lim_{x \to 3} \left[\frac{x^2-9}{x-3}\right]$ [2 marks]

(iv) $\lim_{x \to 4} \left[\frac{x^2+7x+12}{x+4}\right]$ [2 marks]

(v) $\lim_{x \to 2} (x^5)$ [2 marks]

(d) Determine whether the following function is continuous at a specified point.

$Y = 6x + x^2 \; at \; x = 2$ [4 marks]

QUESTION TWO

(a) Given the following function, find critical values of x and establish whether such critical values give rise to relative maximum or relative minimum or both. Find maximum or minimum value of Y.

(i) $Y = f(x) = x^3 - 3x + 4$ [5 marks]

(ii) $Y = f(x) = x + \frac{4}{x}$ [5 marks]

(b) A firm in a perfectly competitive market has the following demand, total variable cost (TVC) and total fixed cost (TFC) functions:

$P = 12.1 \; demand \; function$

$TVC = \frac{1}{20}Q^3 - 1.5Q^2 + 17.5Q$

$TFC = 50$

(i) Find TC, TR and TI (profit) functions. [3 marks]

(ii) Find output level at which profits are maximized. Check the second derivative test. [4 marks]

(iii) Compare the resulting MC and MR at theprofit maximizing output level. [3 marks]

QUESTION THREE

(a) Find the derivatives of the following functions

(i) $Y = f(x) = 7x + 3$ [3 marks]

(ii) $Y = f(x) = 5 - 2x$ [3 marks]

(iii) $Y = f(x) = x^2 + 3$ [3 marks]

(b) Find the elasticity of supply for the

(i) Following function of $P = 20$. Comment on your results.

$Q = 100 + 4P + 0.3p^2$ [4 marks]

(ii) Find the price elasticity of supply for the follow functions $at\ P = 75$. Comment on your results.

$Q = -50 + 2P$ [4 marks]

(iii) Under what conditions will the price elasticity of supply for the function given below be:

(a) Larger than unity [2 marks]
(b) Unit elasticity [1 mark]
(c) Less than unity [1 mark]

QUESTION FOUR

Find MP_L and MP_K for the following production functions

(i) $Q = AK^{\propto}L^{\beta}$ [6 marks]

(ii) $Q = 16K^{\frac{1}{2}}L^{\frac{1}{4}}$ [6 marks]

(iii) In equation (i) above, express MP_L in terms of $\beta, Q\ and\ L\ and\ MP_L$ in terms of $\propto, Q\ and\ K$ [8 marks]

QUESTION FIVE

(a) Consider the follo0wng bivariate utility functions

$U = 25X^{\frac{2}{5}}Y^{\frac{3}{5}}$

(i) (a) Find the MU_X and MU_Y [2 marks]
(b) From your results, find the MRCS between the two goods. [2 marks]

(ii) (a) By setting $\cup = 100$ derive the corresponding indifference curve (express Y in terms of X. [2 marks]

(b) Find the MRCS for $\left(\frac{\partial Y}{\partial X}\right)$for $x = 2$. [2 marks]

(c) Does the indifference curve obey the law of diminishing MRCS.[1 mark]

(b) What is the difference between the following pairs of matrices

(i) $A = \begin{bmatrix} 7 & 0 & 0 \\ 0 & 7 & 0 \\ 0 & 0 & 7 \end{bmatrix}$ $B = \begin{bmatrix} 3 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 5 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$ [2 marks]

(ii) Consider the following square matrix

$$A = [a_{ij}]ij = 5$$

Write down:

(a) 4 first order principal submatrices of A [2 marks]

(b) 2 second order principal submatrices of A. [2 marks]

(c) The second and third leading principal submatrices of A. [2 marks]

(d) One column vector of A [2 marks]

(e) One row vector of A [2 marks]
