



UNIVERSITY OF KABIANGA

UNIVERSITY EXAMINATIONS 2016/2017 ACADEMIC YEAR SECOND YEAR FIRST SEMESTER EXAMINATION

FOR THE DEGREE OF BACHELOR OF ARTS (ECONOMICS)

COURSE CODE: ECO 210

COURSE TITLE: BASIC MATHS

DATE: 16TH DECEMBER, 2016

TIME: 2.00 P.M. – 5.00 P.M.

INSTRUCTIONS TO CANDIDATES

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**SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
ARTS IN ECONOMICS
ECO 210: BASIC MATHS**

Instructions: Answer Question ONE and other THREE. Each on a new page

QUESTION ONE [25 Marks]

[a.] Expand the following summations;

[i.] $\sum_{i=0}^3 k_i x^i$

[ii.] $\sum_{i=0}^2 \sum_{j=0}^2 x_{ij}$

[iii.] $\prod_{i=1}^5 ax^i$

[iv.] $\prod_{i=1}^4 \left(\frac{1}{x_i}\right)$

[4 Marks]

[b.] Find the sum of the following Arithmetic Progression (A.P) given the following information's;

[i.] The first term is **5**

[ii.] The last term is **120**

[iii.] The number of terms is **16**

[3 Marks]

[c.] Sketch the following on the same coordinate plane.

[i.] $2x + y \leq 2$

[ii.] $x \geq 0$

[iii.] $y \geq 0$

[iv.] $y \geq 1$

[6 Marks]

[d.] Sketch the following functions

$$y = \exp(-x) \quad \text{and} \quad y = \exp(x)$$

On same coordinate plane and state the following;

[i.] The domain of the functions

[ii.] The range of the function's

[iii.] The intercept on the vertical axis

[iii.] The intercept of the horizontal axis

[6 Marks]

[e.] Solve for x in each of the following equations;

[i.] $2e^{2x - 100} = 300$

[ii.] $5\ln(x) - 4 = 2$

[iii.] $\ln(\sqrt[3]{x + 30}) = 2$

[6 Marks]

QUESTION TWO [15 Marks]

[a.] My Savings in the bank grows in accordance with the following function;

$$S_t = S_0 e^{rt}$$

Required;

[i.] At an interest rate of **3.7%**, how long will it take for my savings to double? **[2 Marks]**

[ii.] What rate of interest will treble my savings in **15 years**? **[2Marks]**

[iii.] What will my savings be **8 years** from now at a rate of interest of **4.4%**, given that my initial savings is **Ksh. 500**? **[3 Marks]**

[b.] The Total Revenue and Total Cost function is given by the following.

$$TR = 80\ln(Q + 1) \quad \text{and} \quad TC = 3Q$$

Required;

- [i.] Level of **TR** at **Q = 200**
- [ii.] Level of **TR** at **Q = 450**
- [iii.] The profit function
- [iv.] Level of profit at **Q = 10**

[8 Marks]**QUESTION THREE [15 Marks]**

- [a.] I have an investment project with an initial outlay of **\$ 15,000** and will produce a return of **\$35,000** five years from now. Given that another investment opportunity is available in the market at **15%** interest rate compounded annually, determine whether I should proceed with my investment project. For appraising project, apply:

[i.] NPV**[ii.] IRR****[6 Marks]**

- [b.] You are given the following information:

Utility function: $U = f(x, y) = x + 2y + xy$ The budget: $M = 51$ Price of $x = 2$ Price of $y = 5$ **Required:**

- [i.] Write out the consumer budget equation **[1 Mark]**
- [ii.] Construct utility maximization problem from the information given. **[2 Mark]**
- [iii.] Form the corresponding Lagrangian function. **[1 Mark]**
- [iv.] Find the critical values of x , y and λ . **[3 Mark]**
- [v.] Establish that the critical values of x and y give rise to maximum utility. **[1 Mark]**
- [vi.] Find the maximum utility. **[1 Mark]**

QUESTION FOUR [15 Marks]

[a.] Given the following polynomial:

$$Z = f(x_1, x_2, x_3) = x_1^2 + 3x_1x_2 - 2x_1x_3 + 3x_2x_3 + x_2^2 + 5x_3^2$$

- [i.] What type of form is Z ? [1 Mark]
- [ii.] Find the Hessian Matrix (H) for Z [1 Mark]
- [iii.] Find the first (H_1), the second (H_2) and the third (H_3) leading principal sub-matrices of H . [3 Marks]

[b.] A firm producing two products Q_1 and Q_2 under monopolistic market structure has the following demand and cost functions:

$$Q_1 = -2P_1 - P_2 + 40$$

$$Q_2 = -P_1 - P_2 + 35$$

$$C = Q_1^2 + Q_2^2$$

Required:

- [i.] To find the firm's average revenues functions AR_1 and AR_2 for the firm. [3 Marks]
- [ii.] What is the profit function? [1 Mark]
- [iii.] Find the levels of Q_1 and Q_2 that satisfies the first-order condition for maximization. [3 Marks]
- [iv.] Confirm that at \bar{Q}_1 and \bar{Q}_2 , the firm's profits are maximized. [3 Marks]

QUESTION FIVE [15 Marks]

[a.] After how long will a principal of \$700 grow to \$850 if invested at 11% annual interest rate.

- [i.] If compounding is done once a year? [2 Marks]
- [ii.] If compounding is done quarterly? [2 Marks]
- [iii.] If compounding is done monthly? [2 Marks]
- [iv.] If compounding is continuous? [2 Marks]

[b.] Consider the following quadratic form:

$$Q = -3x^2 + 6xy - 4y^2$$

- [i.] Present the quadratic form in matrix format **[1 Mark]**
- [ii.] Denoting the symmetric matrix of coefficients of Q with D
find:
minors
- (a.) The first and the second leading principal submatrices of D . **[2 Marks]**
- (b.) The first and the second leading principal minors of D . **[2 Marks]**
- [iii.] What is the sign of D and Q ? **[2 Marks]**