



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2017/2018

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
ECONOMICS, BACHELOR OF ECONOMICS AND FINANCE, BACHELOR OF
ECONOMICS AND STATISTICS AND BACHELOR OF ARTS

EES 100: MATHEMATICS FOR ECONOMICS I

DATE: Wednesday, 29th November 2017

TIME: 11.00 a.m. - 1.00 p.m.

INSTRUCTIONS:

- Answer questions One (Compulsory) and any other Two questions
- Please be tidy as possible and present your work in an organized manner
- Non-programmable electronic calculators may be used during the examination
- The maximum time allowed for the paper in 2 hours

Question One (30 marks)

- Discuss any four benefits of studying mathematics for Economics (4 marks)
- Solve for x and y given the following: $4x - y = 27$ and $-7x + 6y = -26$ (3 marks)
- Let three sets A, B and C be defined as $A = \{x/ 1 < x < 3\}$, $B = \{x/ 5 \leq x \leq 7\}$ and $C = \{x/ 2 < x < 6\}$ where x is a real number. Determine the following (do not draw Venn diagrams)
 - $A \cup B$ (2 marks)
 - $(A \cup B) \cap C$ (2 marks)
 - $B \cap C'$ (2 marks)
- Solve for x in the equation: $2^{(2x+3)} - 2^{(x+4)} = 17(2^x) - 4$ (4 marks)

- (e) Solve for y in: $\text{Log}_2 y = \text{Log}_2 3 + \text{Log}_2 7 + 2\text{Log}_2 y$ (3 marks)
- (f) Expand $(2 - \frac{1}{4}x)^8$ using Pascal's triangle and then use the first four terms of your expansion to evaluate $(1.975)^8$ to the nearest 3 decimal places (4 marks)
- (g) Simplify: $\frac{(2a^3b^5)^4}{(4a^4b^2)^2} \div \frac{(1/2a^3b^2)^1}{(8a^1b^1)^3}$ (3 marks)
- (h) Find the local maximum and local minimum points of the function $f(x) = x^3 - 3x^2 - 9x$ (3 marks)

Question Two (20 marks)

Haco industries Ltd produce two items, Alon (x) and Balon (y). Each unit of x requires in its production 30 units of raw material A and 15 units of raw material B. Each unit of y requires 45 units of raw material A and 75 units of raw material B. There is a limited supply of only 1800 units of raw material A and 1425 units of raw material B.

Required:

- i) An equation, which expresses the number of units of x and y that can be produced using 1800 units of raw material A. (3 marks)
- ii) An equation which expresses the number of units of x and y that can be produced using exactly 1425 units of raw material of B. (3 marks)
- iii) By solving equations obtained in parts (i) and (ii) simultaneously, determine the number of units of x and y which can be produced by using exactly 1800 units of raw material A and exactly 1425 units of raw material B. (7 marks)
- iv) Suppose the unit prices of x and y are Sh. 10,000 and Sh. 7,000 respectively whereas their respective variable production costs per unit are Sh. 5,000 and Sh. 4,900. Further, their combined fixed costs are Sh. 50,000. Determine the total profit that Haco Industries Ltd will make given production levels obtained in part (iii) above. (7 marks)

Question Three (20 marks)

Given a demand function of a product as $P = 14 - q$ and the unit variable cost $v = q - 4$ while fixed cost is Sh.32.

Determine the following:

- a) Total cost function (3 marks)
- b) Profit function (3 marks)
- c) Output and price for maximum profit. (5 marks)
- d) Sketch a diagram to show the relationship between revenue, cost and profit (3 marks)
- d) Show that the output for maximum profit is not necessarily the same as the output for maximum revenue. (6 marks)

Question Four (20 marks)

Fourth Street Economists consultants have recently started to offer business advice to their clients. Acting as consultants, they have estimated the demand curve of a client's firm to be:

$$AR = 200 - 8q$$

Where AR is average revenue in millions of shillings and q is the output in units. Investigations of the client firm's profile shows that marginal cost (MC) is given by:

$$MC = q^2 - 28q + 173 \text{ (in millions of shillings)}$$

Further investigations have shown that the firm's fixed cost is Sh. 10 million.

Required:

- a) Determine:
 - i) Total revenue function, (3 marks)
 - ii) Total cost function and hence, (3 marks)
 - iii) The profit function. (2 marks)
- b) What advice would you give the client in terms of production level and price to charge if its objective is to maximize profit? What is the maximum profit? (6 marks)

- c) Compare the marginal revenue and average cost values when $q = 5$ units. (3 marks)
- d) Determine the firm's break-even point (point where revenue = cost) (3 marks)

Question Five (20 Marks)

- a. 100 people are asked about three brands of soft drinks called A, B and C. 18 liked A only, 23 like A but not B, 26 like A, 8 like B and C, 48 like C and 8 like A and C while 54 like one and only one of the three drinks.
- Draw a Venn diagram to represent this information (2 marks)
 - Find how many people like B (2 marks)
 - How many people like all the three drinks (2 marks)
 - How many people don't like any of the three drinks (2 marks)
- b. A line L passes through the points $(-2, 3)$ and $(-1, 6)$ and is perpendicular to a line P at $(-1, 6)$
- Find the equation of line L (3 marks)
 - Another line Q is parallel to L and passes through the point $(1, 2)$. Find the x- and y- intercepts of line Q (3 marks)
- c. A consumption function is given by $C = a + b Y$ where C is consumption and Y is income.
- What do the parameters a and b mean or measure? (1 mark)
 - A student in KU consumes Ksh 750 when her income is Ksh 1000, but decides to consume Ksh 850 when her income is increased by Ksh 200. Determine the student's consumption function (2 marks)
- d. Find $\frac{dz}{dx}$ and $\frac{dz}{dy}$ for the function: $Z = 2x^2 - 3y^3 + 4xy^2 - 5x + 3$ (3 marks)