

KISII UNIVERSITY
SCHOOL OF BUSINESS AND ECONOMICS
FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF
BCOM/BBAM/BPSM/BENS
BCOM/BBAM 170: BUSINESS MATHEMATICS 1

STREAM: BBAM/BCOM Y1S1

TIME: 2 HRS

DAY.....

DATE.....

INSTRUCTIONS

- (i) Answer question **ONE** and any **other three** questions
- (ii) Question one carries **25 marks** while the rest of the questions **15 marks** each
- (iii) Do not write on the question paper
- (iv) Show your working clearly

QUESTION ONE - COMPULSORY

(25 marks)

- (a) Consider the following sets:

$$A = \{X|1 \leq x < \infty\}$$

$$B = \{X|4 \leq x \leq 1000\}$$

$$C = \{\dots, -2, -1, 0, 1, \dots\}$$

$$D = \{X|-\infty < x < +\infty\}$$

State whether the following statements are TRUE or FALSE

(3 marks)

- (i) $A \subset B$
- (ii) $\emptyset \subset D$
- (iii) $\{0\} \subset B$
- (iv) $C \subset D$
- (v) $D = C$

- (b) Calculate the point elasticity of demand from the given demand function

$$Q = 100 - 2P + \frac{100}{P}, \text{ at the point where } P = 10. \quad (6 \text{ marks})$$

(c) Find the expansion of $(x + y)^6$ using the binomial theorem by combination **(4 marks)**

(d) Evaluate the following definite integral:

$$\int_2^5 (x + 3)(x - 1) dx$$

(3 marks)

(e) Determine the critical values and find out whether these critical values are maxima or minima. Hence determine the extreme values of the function

$$Y = f(x) = \frac{1}{3}x^3 + x^2 - 35x + 10 \quad (4 \text{ marks})$$

(f) Solve the equation $\frac{3}{2x+1} + \frac{4}{5x-1} = 2$ **(3 marks)**

(g) Given $B = (5, 8, 11, 20, 25)$ and $C = (1, 3, 5, 7, 9, 11, 13)$, find

i) $B \cap C$

ii) $n(B \cup C)$ **(3 marks)**

QUESTION TWO (15 marks)

(a) Consumption (C) is a function of income (Y), given by the following expression:

$$C = 7 + 0.75Y.$$

(i) What is the slope of the consumption function? **(2 marks)**

(ii) Is the function positively or negatively sloped? **(2 marks)**

(iii) What is the level of consumption when $Y = 1$; $Y = 10$? **(3 marks)**

(b) The demand and supply functions for rice are given by:

$$Q_d = 3 - \frac{1}{2}P$$

$Q_s = -1 + \frac{1}{6}P$, where Q_d and Q_s are the quantities of rice demanded and supplied, and P is the price of rice.

i) Graph both these functions on the same coordinate plane **(4 marks)**

- ii) You are told that Equilibrium is attained when the supply of and demand are equal. At what levels of Q and P does this happens? (4 marks)

QUESTION THREE

(15 marks)

- (a) Consider the following consumption and tax functions:

$$C = 70 + 0.85Y$$

$$T = \alpha_0 + \alpha_1 Y$$

- (i) What is the name given to α_1 ? What does it measure? (1 marks)
- (ii) Determine the level of tax and consumption when $Y = 0$. (2 marks)
- (iii) How much income will bring forth a level of consumption expenditure equal to 78.5? (3 marks)
- (iv) If income y increases by 100, how much of that increase will be allocated to consumption (3 marks)

- (b) A National model is given by:

$Y = C + I + G$ where C, I and G are respectively, consumption, investment, and government expenditure components given by:

$$C = a + bY$$

$$I = 0.2Y$$

$$G = 350$$

- (i) Find equilibrium value of Y, that is, express Y in terms of constants in the model. (3 marks)
- (ii) What is the corresponding equilibrium investment? (3 marks)

QUESTION FOUR

(15 marks)

- (a) Construct the appropriate standard form for parabola corresponding to the following expression: $X^2 - 10X + 2Y + 30 = 0$.

Sketch the corresponding parabola if it exist **(4 marks)**

(b) The demand function for a firm is given by:

$$P = \beta_1 - \beta_2 Q$$

Find:

(i) The average revenue function of the firm and comment on your result

(2 marks)

(ii) The total revenue function of the firm **(2 marks)**

(c) The demand and total cost functions facing a firm are:

$$P_1 = 26 - 3Q_1 - Q_2$$

$$P_2 = 33 - Q_1 - 2Q_2^2$$

$$TC = Q_1^2 + Q_1 Q_2 + 2Q_2^2$$

Find:

(i) The average revenue functions for commodities Q_1 and Q_2 . **(2 marks)**

(ii) The total revenue for the firm **(1 marks)**

(iii) The average cost function with respect to Q_1 and Q_2 **(2 marks)**

(iv) The profit function for the firm **(2 marks)**

QUESTION FIVE **(15 marks)**

(a) The demand component of a market model is given by:

$P = -Q^2 - 6Q + 7$ and the supply component is given by:

$P = Q^2 + 3Q + 2$. Find the equilibrium price and quantity in the market. Comment on your answer. **(4 marks)**

(b) Consider a two commodity market model represented by:

$$Q_{d1} = 4 - P_1 + \frac{1}{2}P_2$$

$$Q_{s1} = -\frac{5}{2} + \frac{3}{2}P_1$$

$$Q_{d2} = 8 + 2P_1 - 2P_2$$

$$Q_{s2} = -3 + 6P_2$$

Calculate the equilibrium prices and quantities for the market **(4 marks)**

