

PWANI UNIVERSITY COLLEGE
A CONSTITUENT COLLEGE OF KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2008/2009 ACADEMIC YEAR

1ST YEAR 1ST SEMESTER EXAMINATION FOR THE DEGREE OF
STREAM: BACHELOR OF ARTS (B.A)

AEC 101: INTRODUCTION TO MATHS OF ECONOMICS

END SEMESTER: I

TIME: 3 HOURS

DAY/TIME: THURSDAY: 11.00 A.M.- 2.00 P.M. DATE: 27/11/2008

INSTRUCTIONS

- Answer **ALL** questions in section **A** and any **TWO(2)** questions in Section **B**
- Marks for each question are indicated in the brackets ()

Q.1) The quantity of Tea demanded is related to the price as shown below
 $Q = 3 - \frac{1}{3} P$

- i) Graph this function
- ii) What is the demand for Coffee when price is zero
- iii) What is the demand for coffee at price levels 2 and 6, respectively?
(6 mks)

Q.2) The following and consumption and Tax functions in a closed economy

$$C = a + bY^d$$

$$T = tY$$

$$Y^d = Y - T$$

- i) Express C as a function of Y
- ii) What is the level C when Y = 0

iii) Given $Y = 50$, $a = 50$, $b = 0.8$ and $t = \frac{1}{4}$, find the level of C .
(5 mks)

Q.3) Given the market model:

$$Q_d = \alpha_0 - \alpha_1 P$$

$$Q_s = -B_0 + B_1 P$$

$$\text{Where } \bar{P} = \frac{\alpha_0 + B_0}{\alpha_1 + B_1}; \quad \bar{Q} = \frac{\alpha_0 B_1 - \alpha_1 B_0}{\alpha_1 + B_1}$$

Find the effect of changes in α_0 and α_1 on equilibrium quantity
(7 mks)

Q4) Given the following average and cost functions

$$AR_1 = 6 - Q_1 - 3Q_2$$

$$AR_2 = 2 - 4Q_1 - Q_2$$

$$TC = 2Q_1^2 + 3Q_1Q_2 + \frac{1}{2} Q_2^2$$

Determine the corresponding profit function
(6 mks)

Q.5) The demand and supply components of a market model are represented by:
 $P = -Q^2 - 6Q + 7$
 $P = Q^2 + 3Q + 2$

Find the equilibrium price and quantity in the market
(6 mks)

Q.6) a) Determine the profit function, given the following functions

$$\begin{aligned} TR &= aQ - bQ^2 \\ TC &= F + dQ \end{aligned} \quad (2 \text{ mks})$$

b) If $a = 9$, $b = 2$, $d = 2$ and $F = 3$, find the level of Q for which profit is zero
(5 mks)

Q.7) The following is a two-commodity market mode.

$$Q_{d1} = 8 - 2P_1 + P_2$$

$$Q_{s1} = -5 + 3P_1$$

$$Q_{d2} = 16 + P_1 - P_2$$

$$Q_{s2} = -1 + 2P_2 \quad (7 \text{ mks})$$

Determine the equilibrium prices and quantities in the market model.

Q.8) Find the slope of the function

$$y = \sqrt{3x^2 + 5x + 1} \text{ at } x = 0 \quad (5 \text{ mks})$$

Q.9) An Individual's level of consumption is 120 when he has zero Income, and his consumption rises by 85 for every 100 units additions to his income. Determine:

- i) His Consumption function
- ii) His Marginal propensity to consume
- iii) His Marginal propensity to save (6 mks)

Q.10) a) Given the following cost function

$$C = Q_1^2 + 4Q_2^2 - Q_1Q_2 + 18$$

Determine the marginal cost with respect to Q_1 and Q_2 (2 mks)

- b) Determine Cross partial derivatives for $F(x_1, x_2) = x_1^2 + x_1x_2^2$ (3 mks)

SECTION B - ANSWER ANY TWO(2) QUESTIONS

Q.11) a) The Supply and Demand functions for a given firm are given by

$$Q_s = -5 + \frac{1}{2} P$$
$$Q_d = 10 - \frac{1}{2} P$$

If the government decides to impose a per Unit tax "t" on output supplied by the firm, find.

- i) The tax rate that will maximize Government tax Revenue
- ii) The maximum tax revenue (14 mks)

b) For the following utility function

$$U = Q_1^{1/2} Q_2^{5/2}$$

- i) Determine the marginal utility of Q_1 and Q_2

- ii) State whether the utility function displays characteristics of diminishing or increasing marginal utility with respect to Q_1 and Q_2 (6 mks)

Q.12) a) Given the following production function
 $Q = 16 + \frac{1}{K} - \frac{1}{L^2}$

Determine the marginal products and state where they are increasing, decreasing or constant. (8 mks)

b) Given the function

$$Z = -8x^2 + 32x + 8xy - 24y - 4y^2$$

- i) Find the value of x and y for which z is extreme
 ii) Is the extreme value in (i) above maximum or minimum
 iii) Calculate the extreme value (12 mks)

Q.13) a) The production and cost functions of a firm are given by

$$Q = AL^\alpha K^{1-\alpha}; \quad C = wL + rK$$

- i) Give a constrained output maximization from the information Given
 ii) What is the corresponding augment objective function
 iii) Show that the least cost combination is attainable when inputs are combined such that the ratio of marginal products equal their price ratio (11 mks)

b) Given the following demand functions

$$\begin{aligned} Q_1 &= 7 - 2P_1 - P_2 \\ Q_2 &= 23 - P_1 - 3P_2 \end{aligned} \quad Q_1, Q_2, P_1, P_2 > 0$$

- i) Compute the partial elasticities for demand
 ii) State, giving reason, whether the two commodities are substitutes or complements (9 mks)

