



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2009/2010

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
ECONOMICS, BACHELOR OF COMMERCE AND BACHELOR OF
EDUCATION

EES 200: MATHEMATICS FOR ECONOMICS II

DATE: Tuesday, 29th December, 2009

TIME: 11.00 a.m. – 1.00 p.m.

INSTRUCTIONS:

Answer question **ONE** and any other **TWO** questions.

- a) Find the product of matrix a and B given below:

$$A = \begin{bmatrix} 5 & 2 & 1 \\ 8 & 8 & 7 \\ 9 & 6 & 3 \\ 1 & 4 & 6 \end{bmatrix}$$

$$B = \begin{bmatrix} 9 & 0 \\ 3 & 4 \\ 7 & 5 \end{bmatrix}$$

(3 marks)

- b) $z = 5x^2 - 4xy + y^2$

- i) Get the 1st order and 2nd order total differentials of function z.

(3 marks)

- ii) Comment on whether the function has a minima or a maxima point

(2 marks)

- c) Find the consumer surplus for the function

$P = 35 - Q^2$ at price of 10 shillings (use graphs to illustrate your working)

(4 marks)

- d) The following matrix A shows the input coefficient matrix of Jipange economy.

$$A = \begin{bmatrix} 0.05 & 0.20 & 0.025 \\ 0.05 & 0.10 & 0.025 \\ 0.60 & 0.60 & 0.15 \end{bmatrix}$$

The final demand matrix is given as:

$$F = \begin{bmatrix} 130 \\ 70 \\ 50 \end{bmatrix}$$

- i) Find the total output requirements for the 3 sectors in Jipange economy.

(8 marks)

- ii) Find the total primary input requirements for each of the 3 sectors

(2 marks)

- e) An economy is represented by the following system of equations:

$$Y = C + I + G + X - M$$

Where

$$C = b_o + b_1 Y^d$$

$$I = I_o \quad b_o > 0$$

$$G = G_o \quad 0 < b_1 < 1$$

$$X = X_o$$

$$M = M_o + M_1 Y \quad M_o > 0 \quad 0 < M_1 < 1$$

$$T = t_o + t_1 Y \quad t_o > 0 \quad 0 < t_1 < 1$$

- i) Find the equilibrium value of Y (5 marks)

- ii) If the government wants to increase the national income, should it adopt an increase in tax rate or a decrease in tax rate. (Make your comment based on the tax rate multiplier) (3 marks)

Q.2 a) Solve for X, Y and Z in the following system of equations:

$$4x+3y=9$$

$$2x+4y+z=0 \quad (6 \text{ marks})$$

$$3x-2y+4z=3$$

b) The utility function of a consumer is given as

$$U=Q_1^2+3Q_1Q_2-5Q_2^2$$

While his budget constraint is given as:

$$2Q_1+3Q_2=6.$$

i) Find the level of Q_1 and Q_2 that will maximize the utility of the consumer. (7 marks)

ii) Show that at the utility maximization point for this problem, the slope of the indifference curve will be equal to the slope of the budget line. (2 marks)

c) Find the degree of homogeneity of the following functions:-

i) $Q=\frac{4XY^2-2x^2Y}{3XY}$ (2 marks)

ii) $Y=\frac{5X^2Z+10XZW-9XW^2}{3Z^2W^2}$ (3 marks)

Q.3 a) Differentiate the following non-algebraic functions:

i) $Y=\frac{L_nX}{e^x}$ (2 marks)

ii) $Y=[1+3X^2][e^{5x}]$ (3 marks)

iii) $y=2L_n(1+\sqrt{x})$ (3 marks)

b) The supply function of a firm is given as:

$$Q^2=4P-6$$

Find the producer surplus when $P=10.5$ (6 marks)

c) The total cost function for a firm is given as:

$$TC=2Q_1^3+3Q_2^2-Q_1Q_2+10$$

Find:

- i) The average cost for good 1. (1 mark)
- ii) The marginal cost for good 1 and good 2 (3 marks)
- iii) If function display increasing or decreasing marginal cost with respect to:
 - i) Good 1 (1 mark)
 - ii) Good 2 (1 mark)

Q.4 a) Solve for X_1 and X_2 in the following linear programming problem. Using graphical method

Maximize: $TT = 5X_1 + 8X_2$

Subject to:

- i) $8X_1 + X_2 \leq 200$
- ii) $X_1 + 2X_2 \leq 100$
- $X_1, X_2 \geq 0$

(8 marks)

Clearly label all your graphs.

b) Given a production function:

$$Q = 5K^{\frac{1}{4}}L^{\frac{3}{5}}$$

- i) Proof Eulers theorem for this function (3 marks)
- ii) Find the nature of returns to scale for the functions (1 mark)

c) The demand and supply functions for 2 products are given by the following functions:

$$Qd_1 = 4 - P_1 + \frac{1}{2}P_2 \quad Qd = 8 + 2P_1 - 2P_2$$

$$Qs_1 = \frac{5}{2} + \frac{3}{2}P_2 \quad Qs_2 = -3 + 6P_2$$

Find:

- i) Partial elasticity of demand for good 1 with respect to its own price at equilibrium (4 marks)

- ii) Cross partial elasticity of demand of good 2 with respect to price of good 1 at the equilibrium. (3 marks)
- iii) Are the 2 goods substitutes or complements? Give reasons for your answer. (1 mark)

- Q.5 a) Briefly explain the importance of comparative statics (2 marks)
- b) Integrate the following functions with respect to dx :

i) $\int_2^3 X^2(X^3 - 2)dx$ (4 marks)

ii) $\int 3X^7[X^8 - 3]^5 \cdot dx$ (4 marks)

- c) The production function for a firm is given as:

$Q = AK^B L^6$ while the Isucost function is given as $C = rK + wL$ show that at the point where the firm minimizes its cost, the slope of the isuquart will be equal to the slope of Isucost function. (8 marks)

- d) Differentiate between consumer surplus and producer surplus (2 marks)