



KABARAK UNIVERSITY
UNIVERSITY EXAMINATIONS
2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS AND
MATHEMATICS

COURSE CODE: ECON 211

COURSE TITLE: MATHEMATICS FOR ECONOMICS II

STREAM: Y2S1

DAY: THURSDAY

TIME: 2.00 – 4.00 P.M

DATE: 16/12/2010

INSTRUCTIONS:

1. Answer Question **ONE** and any other **TWO** questions.
2. Apart from question **ONE**, all other questions carry equal marks. Marks for subdivisions are shown in brackets.
3. Calculators are allowed in the examination room provided they are not programmable and can store or recall information.
4. Marks will be awarded to candidates who demonstrate clarity and accuracy of presentation.
5. Diagrams should be used where helpful.

PLEASE TURNOVER

QUESTION ONE

a) Given the demand function:

$$Q = 100 - 2P + P_R + 0.1Y$$

Where P=price of the commodity in question=10,

P_R =price of the related commodity=12

Y=consumer's income =1000

(i) Find, Cross price elasticity of demand and interpret your answer. (3mks)

(ii) Demand function is given as:

$$P = 25 - 0.5Q$$

If Q changes from 10 to 20, find the total change in TR. (3mks)

b) A firm's production function is given by:

$$Q = 10K^{\frac{1}{2}}L^{\frac{1}{2}}$$

The price of Capital and Labor is 4 and 5 respectively.

Using substitution method, find the values of K and L which minimizes total input cost if the production quota is 1200. (6mks)

c) i. Explain why Lagrange multiplier method is often preferred to substitution method in solving constrained optimization problems. (3mks)

ii. The marginal revenue of a monopolist is given by:

$$MR = 1 - 0.4Q$$

Find the total revenue function. (3mks)

d) An economy is based on three sectors, Coal, Oil and Transportation. Production of a shilling worth of Coal requires an input of 20cts from the Coal sector and 40cts from the

transportation sector. Production of a shilling worth of Oil requires an input of 10cts from the Oil sector and 20cts from the transportation sector. Production of a shilling worth of transportation requires an input of 40cts from the Coal sector, 20cts from the Oil sector and 20cts from the transportation sector.

Write the matrix for technical coefficients. (6mks)

- e) i. Define linear programming (LP) (3mks)
ii. Using examples, explain the three ingredients/components of a Linear Programming problem (3mks)

QUESTION TWO

a) The productivity of a firm is given by the cob-Douglas production function of the form:

$$Q = 2L^2K^3$$

- i. If the company is currently employing 4 units of labor and 2 units of capital, find MPP_L and MPP_K . (5mks)
- ii. For the greatest increase in productivity, should the management encourage increased use of labor or capital? (3mks)

b) Given total utility function of the form:

$$U = f(X_1X_2)$$

Show that Marginal Rate of substitution (MRS) is equal to the ratio marginal utilities of the two commodities X_1 and X_2 which is also equal to the slope of the indifference curve. (6mks)

c) Utility function is given by:

$$U = X_1^2X_2^3X_3^4$$

If X_1 changes from 1 to 2, X_2 changes from 2 to 4 and X_3 changes from 3 to 5, find the total change in utility. (6mks)

QUESTION THREE

- a) Suppose KPLC has two types of customers to supply electricity;
- Domestic users- d
 - Industrial users- i

The demand function for domestic and industrial users are given by:

$$P_d = 1000 - 5Q_d$$

$$P_i = 10,000 - 2.5Q_i$$

The cost of producing electricity is the same for both group of customers and is given by:

$$TC = 100 + 20Q + 0.1Q^2$$

Assuming the company practices price discrimination, find:

- i. Output sold to each type of customers (7mks)
- ii. Price charged each type of customers (3mks)
- iii. Maximum profit (2mks)

b) In absence of price discrimination, find,

- i. The common price to be charged both types of customers. (6mks)
- ii. Maximum profit (2mks)

QUESTION FOUR

a) The W & S Company manufactures commercial zippers of two kinds, kind X and kind Y. Its

Production Department estimates that the average cost function of the firm is:

$$AC = X^2 + 2Y^2 - 2XY - 2X - 6Y + 20$$

- i. The firm expects an order of both zippers that will require it to produce a total output of 6 units of both kinds of zippers. The manager would like to know how many of each type of zipper the firm must produce to minimize its average cost, and what its minimum average cost would be if it receives the order. (7mks)

- ii. While the firm expects the order to be 6 units, it may be as large as 7 units or as small as 5 units. Estimate the minimum average cost of the firm with these different order sizes. (3mks)

b) Find the Consumer's and producer's surplus given the following demand and supply equations:

$$P = 25 - 0.001Q^2$$

$$P = 5 + 0.1Q$$

(10mks)

QUESTION FIVE

a) i. The monthly sales of two types of meals B_1 and B_2 in three food restaurants R_1 , R_2 and R_3 are as follows;

January

	R_1	R_2	R_3
B_1	35	27	13
B_2	42	39	24

February

	R_1	R_2	R_3
B_1	31	17	3
B_2	25	29	16

- i. Write down 2×3 matrix J and F representing sales in January and February respectively. (2mks)
- ii. By finding $J+F$, write down the matrix for the total sales over the two months. (2mks)
- iii. If the three food restaurants increase their demand for B_1 and B_2 , in the next month from their current demand by 20%, write down the matrix for next month. (2mks)

ii. The equilibrium levels of consumption C and income Y for the simple two sector macroeconomic model satisfy the structural equations;

$$Y = C + I$$

$$C = aY + b$$

Express this system in matrix form and find the values of Y and C in terms of constants a , b and I . (4mks)

b) A manufacturer of lightweight mountain tents makes a standard model and an expedition model for national distribution. Each standard tent requires 1 labor hour from the Cutting Department and 3 labor hours from the Assembly Department. Each expedition tent requires 2 labor hours from the Cutting Department and 4 labor hours from the assembly department. The maximum labor hours available per day in the Cutting Department and the Assembly Department are 32 and 84 respectively. If the company makes a profit of Ksh 50 on each standard tent and Ksh 80 on each expedition tent, how many tents of each type should be manufactured each day to maximize profit (assuming all the tents can be sold)?

(10mks)