JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BUSINESS AND ECONOMICS

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF BUSINESS ADMINISTRATION – WITH IT

2ND YEAR 1ST SEMESTER 2013/2014 ACADEMIC YEAR

KISII

COURSE CODE: ABA 205

COURSE TITLE: MANAGEMENT MATHEMATICS II

EXAM VENUE:LR **STREAM: (BBA)**

DATE: 15/8/14 **EXAM SESSION: 9.00 – 11.00AM/PM**

TIME: 2 HOURS

Instructions:

1.Answer question 1 (compulsory) and any other 2 questions .

2.Candidates are advised not to write on the question paper.

3.Candidates must hand in their answer booklets to the invigilator while in the examination room.

<u>QUESTION ONE (30 MARKS COMPULSORY)</u>

a. **(i). Find the derivative of the function** $P = \frac{12}{q^3} + 6q^{\frac{4}{3}} - 200q - 70$ (3marks)

(ii). A cost function is given as Kshs $C = Q^2 - 30Q + 256$, Where Q = quantity of units produced. Find the point of minimum average cost. (4marks)

b. Given that $A = \begin{bmatrix} 6 & -2 & 5 \\ 8 & 1 & 7 \\ -3 & 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 4 & 2 \\ 6 & 0 & 4 \\ 9 & 2 & -1 \end{bmatrix}$

Find;

i. $A^T + 2B$ (3marks)

ii. AB (3marks)

iii. Determinant of B (3marks)

c. (i). Outline the components of a Linear Programming problem (3mks)

(ii). A company manufactures two types of products, A and B. Each product uses two processes, I and II. The processing time per unit of product A on process I is 6 hours and on the process II is 5 hours. The processing time per unit of product B on process I is 12 hours and on process II is 4 hours. The maximum number of hours available per week on process I and II are 75 and 55 hours respectively. The profit per unit of selling A and B are Kshs12 and Kshs10 respectively.

Required

Formulate alinear programming problem that can be used to solve this model

(5marks)

d. (i). Evaluate: $\int_2^{10} (100 + 20x + 3x^2)\, dx$ (3Marks)

(ii). The Marginal revenue (MR) function of Sindigiza Co. Ltd is determined to be

MC = 200-2Q. Find the total revenue of the firm when between 100 and 200 units are sold

(3marks)

QUESTION TWO (20 MARKS)

a. Explain the following terms as used in linear programming (6marks)
   i. Objective function
   ii. Slack variable
   iii. Optimal solution

b. Given the folowing liear programming problem

Maximize $Z = 80X_1 + 60X_2$

Subject to;

$4X_1 + 2X_2 \leq 1600$

$2X_1 + 5X_2 \leq 2000$

$X_1, X_2 \geq 0$

i. Formulate the relevant simplex problem (4marks)

ii. Solve the simplex formulation to determine the values of X_1 and X_2 (9Marks)

iii. What is the maximum value of Z (1mark)

QUESTION THREE (20 MARKS)

a. Define the following terms as used in Markov analysis:
   i. Transition matrix. (2marks)
   ii. Equilibrium (2marks)
   iii. Absorbing state (2marks)

b. In 2009 a firm A held 50% of the total market share and two other firms B and C held 30% and 20% respectively.

Based on a study conducted by a marketing research firm the following facts were compiled. On yearly basis:

- A retains 60% of its market share while gaining 30% of B's customers and 40% of C's customers
- B retains 50% of its customers, gains 20% of A's customers and 10% of C's customers
- C retains 50% of its customers, gains 20% of A's customers and 20% of B's customers

i. write the transition matrix (2mark

ii. Determine each firm's market share on 2010 and 2011 (4marks)

iii. Determine each firm's market share at equilibrium (8marks)

QUESTION FOUR (20MARKS)

a) Find the derivative of the following functions

   i. $y = (5x^2 + 3x - 2)(2x + 1)$ using the product rule (4marks)

   ii. $y = \frac{3x^2+2}{x-2}$ using the quotient rule (4marks)

b) The total cost and total revenue functions of a firm are established to be

$$TR = 600Q - 2Q^2$$

$$TC = 500 + 100Q + 3Q^2$$, where Q is the quantity sold.

Find the units the firm should produce and sell to maximize its profits (5marks)

c) Your company manufacturers large scale units. It has been shown that the marginal (or variable) cost, which is the gradient of the total cost curve, is (92 – 2x) Shs. thousands, where x is the number of units of output per annum. The fixed costs are Shs. 800,000 per annum. It has also been shown that the marginal revenue which is the gradient of the total revenue is (112 – 2x) Shs. thousands.

Required

   i. Establish by integration the equation of the total cost curve (2marks)

   ii. Establish by integration the equation of the total revenue curve (2marks)

   iii. Establish the break even situation for your company (3marks)

QUESTION FIVE (20MARKS)

a. By use of appropriate examples explain the following concepts as used in matrix algebra:

   (i) Identity Matrix (2marks)

   (ii) singular matrix (2marks)

b. Research has shown that output Y of a firm is related to labour (L) and capital (K) as follows.

$$Y = aL + bK + cKL.$$

From previous observations, the following was recorded: the output was 1610 when labour was 9 units and capital was 4 units; the output was 2100 when labour was 10 units and capital 5 units. Finally output was 3260 when labour was 12 units and capital 7 units

   i. Formulate a 3x3 system of linear equations hence a matrix equation (3marks)

ii. Solve the matrix equation in (i) above using cofactors method (10marks)

iii. Write the function of output in terms of labour and capital hence determine the output when 8 units of labour and 10 unit of capital are used (3marks)

END