JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BUSINESS & ECONOMICS

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

2ND YEAR 1ST SEMESTER 2016/2017 ACADEMIC YEAR

KISII CAMPUS-PART TIME

COURSE CODE: ABA 205

COURSE TITLE: MANAGEMENT MATHEMATICS II

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

DATE: **EXAM SESSION:**

TIME: 2 HOURS

Instructions:

1. **Answer Question ONE (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.**

QUESTION ONE (30 MARKS)- COMPULSORY

(a) A fast food chain has three shops A ,B and C .The average daily sales and profit in each shop is given in the following table.

	Units sold			Unit profit		
	Shop A	Shop B	Shop C	Shop A	Shop B	Shop C
Burger	800	400	500	$20	$40	$33
Chips	950	600	700	$50	$45	$60
Drinks	500	1200	900	$30	$35	$20

Use matrix multiplication to determine,

(i) The profit for each product **(4 marks)**

(ii)The profit for each shop **(4 marks)**

(b) If $C = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 2 & 3 \\ 1 & 4 & 5 \end{bmatrix}$, determine;

(i) Determinant of A **(2 marks)**

(ii) Ad joint of A **(5 marks)**

(iii) Inverse of A **(1 marks)**

(iv) Hence solve the system of equations:

$2x_1+3x_2+4x_3 = 1$

$x_1+2x_2+3x_3 = 1$

$x_1+4x_2+5x_3 = 2$ **(3 marks)**

(c) (ii) What is linear Programming? **(1 Mark)**

(iii)Highlight the four steps involved in the formulation of a Linear programming model **(4 marks)**

(d) (i) Work out: $\int(8x^3 + 3x^2 - 10x - 7)dx$ **(2Marks)**

(ii) The manager of Nakumatt retail stores in Kisii determines the marginal revenue (MR in Ksh.) of the store to be $MR=600+6Q^2$, where Q is the total number of items sold. Find the total revenue if between 10 and 30 items are sold.

(4 Marks)

QUESTION TWO (20 MARKS)

(a) (i) State any FOUR assumptions of a linear programming problem. **(4 Marks)**

(ii) Highlight two types of objective/ criterion functions **(2 Marks)**

(b) Unique Furniture Company manufactures tables and chairs using two resources: timber and labour. The table below shows the resources consumed and the unit profit for each product.

Inputs	**UNIT REQUIREMENT**		Necessary maximum supply of inputs
	TABLE	CHAIR	
Timber (feet)	30	20	300
Labour (hrs)	5	10	110

The profit for each table and chair is worked out to be Kshs 600 per table and Kshs 800 per chair

i. By taking X to be the number of tables and Y to be the number of cars manufactured, formulate a linear programming problem. **(4 Marks)**

ii. Use graphical method to determine the number of tables and chairs that the firm should manufacture to maximize profits **(9 Marks)**

iii. What is the maximum profit to be anticipated **(1Mark)**

QUESTION THREE (20 MARKS)

a. Differentiate the following function:

i. $y = (x^2 + 3)(2x^3 + x^2 - 3)$ using the product rule **(3 Marks)**

ii. $y = \frac{5x^2 + 4}{2x - 3}$ using the quotient rule **(3 Marks)**

b. Sansora bakery in Kisii County estimates its Total Cost (TC) and Total Revenue (TR) functions to be:

$TC = 1000 + 200Q + 2Q^2$

$TR = 600Q - 3Q^2$

i. Obtain the Marginal Cost (MC) and Marginal Revenue (MR) functions of the firm hence the profit maximizing output. **(6 Marks)**

ii. Find the maximum profits the company should expect **(2 Marks)**

iii. Find the Total Variable Cost, the Average Cost and Average Variable Cost of the firm at the profit maximizing output. **(6 Marks)**

QUESTION FOUR (20 MARKS)

(a) (i) What is a singular matrix? **(1 Mark)**

(ii) Given $A = \begin{bmatrix} 1 & 4 & 6 \\ 3 & 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & 0 \\ 1 & 2 & 6 \\ 4 & 0 & 2 \end{bmatrix}$

Find : B^T **(2 Marks)**

AB **(3 Marks)**

(b) Given X1= no. of Chairs and X2= no. of Tables, you are required to:

Maximize Profit, P= 45X1 + 80X2,

Subject to: 5X1 + 20X2 <= 400;

10X1 + 15X2 <=450;

X1>=0, X2 >= 0.

(i) Formulate relevant simplex problem **(3 Marks)**

(ii) Solve the simplex formulation up to two tableau **(9 Marks)**

(iii) Hence from your tableau indicate the number of chairs and tables to be produced and work out the profit thereof. **(2 Marks)**

QUESTION FIVE (20 MARKS)

(a) There are three industries in an economy. Their input – output coefficient matrix is given below.

$$A = \begin{bmatrix} 0.2 & 0.3 & 0.2 \\ 0.4 & 0.1 & 0.2 \\ 0.1 & 0.3 & 0.2 \end{bmatrix}$$

If the final demand vector is:

$$\begin{bmatrix} 10 \\ 5 \\ 6 \end{bmatrix}$$

Calculate the final output matrix (6 marks)

(b) Equity bank calculates the credit ratings of its credit card customers on a monthly basis. The ratings are poor, good and excellent depending on the payment history. The following matrix shows how the customers change from one category to the other in one month:

		TO		
		Poor	Good	Excellent
FROM	Poor	0.8	0.18	0.02
	Good	0.2	0.75	0.05
	Excellent	0.0	0.16	0.84

Given that in August 2013, from customer base of 100,000 the accounts were classified as

Poor	30,000
Good	50,000
Excellent	20,000

Required:

The expected classification of the accounts in October **(4 Marks)**

(c) XYZ Ltd.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. Total cost function **(4 Marks)**

ii. Total revenue function **(4 Marks)**

iii. Break even situation for your company **(2Marks)**