



**JARAMOGI OGINGA ODIGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF BUSINESS & ECONOMICS**  
**UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELORS OF**  
**BUSINESS ADMINISTRATION WITH IT**  
**1<sup>ST</sup> YEAR 1<sup>ST</sup> SEMESTER 2018/2019 ACADEMIC YEAR**  
**KISII CAMPUS-PART TIME**

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**COURSE CODE: ABA 205**

**COURSE TITLE: MANAGEMENT MATHEMATICS II**

**EXAM VENUE:**

**STREAM: (BBA )**

**DATE: ---**

**EXAM SESSION: ----**

**TIME: 2 HOURS**

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**Instructions:**

- 1. Answer QUESTION ONE and any other TWO 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 (30MARKS)- COMPULSORY**

- a. By giving appropriate examples explain the following concepts as used in matrix algebra:
- i. Identity matrix (2marks)
  - ii. Square matrix (2marks)
  - iii. Singular matrix (2marks)
- b. (i). Outline the components of a Linear Programming problem (4marks)
- (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 a linear programming problem that can be used to solve this model if the company wants to maximise the profit. (5marks)

- c. (i). Evaluate:  $\int_2^{10} (100x + 6x^2) dx$   
(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)

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

Find;

- i.  $A^T + 2B$  (3marks)
  - ii.  $BA$  (3marks)
- e. The manager of ABC Co. in Kisii determines its Total Revenue (TR) to be  $TR = 840Q - 6Q^2$ , where Q is the total number of items sold.
- Required:
- the value of Q that maximizes TR      hence the total revenue (4marks)

### QUESTION TWO (20 MARKS)

A soft drink manufacturing company has 300 ml and 150 ml canned cola as its products with profit margin of Kshs4 and Kshs2 per unit respectively. Both the products have to undergo process in three types of machine. The following Table, indicates the time required on each machine and the available machine-hours per week.

Requirements	Cola 300 ml	Cola 150ml	Maximum Available machine hours per week
Machine 1	3	2	300
Machine 2	2	4	480
Machine 3	5	7	560

- Formulate the Linear Programming problem specifying the product mix which will maximize the profits within the limited resources (5marks)
- Formulate the relevant simplex problem (4marks)
- Solve the simplex formulation to determine the values of  $X_1$  and  $X_2$  (10marks)
- What is the maximum profit to be anticipated (1mark)

### QUESTION THREE (20 MARKS)

- Explain the following concepts as used in Markov chain analysis;
  - Probability Transition matrix (2 marks)
  - Equilibrium state (2 marks)
  - Absorbing state (2 marks)
- The manufacturer of power dry cells has been facing competition on its main brand Ohuru Power. The manufacturer is considering an extensive advertising and rebranding for Ohuru Power. If the current branding remains, the transition matrix of customers between Ohuru power and other brands will be as follows.

		To	
		Ohuru Power	Others
From	Ohuru Power	0.85	0.15
	Others	0.25	0.75

After rebranding & advertising campaign, the probability transition matrix is;

		To	
		Ohuru Power	Others
From	Ohuru Power	0.95	0.05
	Others	0.45	0.55

The advertising and rebranding campaign is expected to cost Kshs. 20 million each year. There are 40 million consumers of dry cells in the market and for each consumer the average profitability is Kshs. 5 annually.

**Required:** Determine,

- the equilibrium state proportion of consumers using Ohuru power before the advertising and rebranding campaign. (5 marks)
- the equilibrium state proportion of consumers using Ohuru power after the advertising and rebranding campaign. (5 marks)

(iii) the expected annual profit increase or decrease after advertising and rebranding campaign. Would you recommend the advertising and rebranding complain? (4 marks)

**QUESTION FOUR (20MARKS)**

- a. By use of appropriate examples explain the properties of matrix addition (4marks)
- b. Research has shown that output Y of a firm is related to labour (L) and capital (K) as follows.

$$Y = \alpha L + \beta K + \Omega KL.$$

From previous observations, the following was recorded: the output was 100,000 when labour was 9 units and capital was 4 units; the output was 120,000 when labour was 10 units and capital 5 units. Finally output was 150,000 when labour was 11.5 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 crammers rule (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)

**QUESTION FIVE (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

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

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

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  $(92 - 2Q)$  Shs. thousands, where Q 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  $(112 - 2Q)$  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)