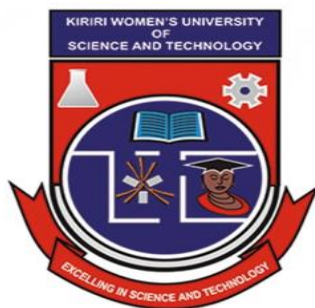




KIRIRI WOMEN UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS 2024
FIRST YEAR EXAMINATION FOR THE DEGREE OF MASTER OF BUSINESS
ADMINISTRATION]
UNIT CODE: KMS 3106
UNIT NAME: BUSINESS QUANTITATIVE ANALYSIS

Date: _____ **Time:** _____

INSTRUCTIONS:

- 1) Answer Question ONE and any other THREE questions.
- 2) Mobile phones and any written material are prohibited in the examination room.
- 3) No writing should be done on this question paper. Any rough work should be done at the back of the answer booklet and canceled.
- 4) All answer booklets should be handed in at the end of the exam whether used or not.
- 5) Programmable calculators are prohibited.

Question One (40 Marks)

- a) The following expressions define a firm's total revenue and total costs functions

$$\text{Total revenue} = 12x - x^2 + 48$$

$$\text{Total cost} = \frac{x^3}{3} - 3x^2 + 60$$

Where x = number of units

- i. Find the optimum production level (6 marks)
 - ii. Verify that profit is maximum at this level. Hence or otherwise, find the firm's profit at this level (4 marks)
- b) Given the data below representing rents (in KSh. '000) paid by house tenants in a Komarock estate

Rent	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70
No. of Houses	7	13	9	18	12	21	11	9	7	3

Required:

- i. Obtain the mean average house rent in Komarock estate (4 marks)
- ii. Find the modal value of the rent (4 marks)
- iii. If houses of the first 10% of all houses are considered for demolition and upgrading, find the cut-off rent for this category (4 marks)

- c) Consider an economy with three sectors: agriculture, manufacturing, and services. The input-output matrix A is given by:

$$A = \begin{bmatrix} 0.2 & 0.1 & 0.1 \\ 0.4 & 0.3 & 0.2 \\ 0.3 & 0.4 & 0.4 \end{bmatrix} . \text{ If the total output of the economy is represented by the vector:}$$

$$X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \text{ and the demand vector is: } D = \begin{bmatrix} 50 \\ 60 \\ 70 \end{bmatrix}, \text{ find the production levels } x_1, x_2, \text{ and}$$

x_3 needed to satisfy the demand. (6 marks)

- d) A manufacturer of optical lenses has the following data on the cost per unit (in USD) of a certain custom-made lenses and the number of units made in each order

Number of Units (X)	1	3	5	7	10	12
Cost per Unit (Y)	58	52	46	40	37	22

- i. Obtain the simple linear regression model (6 marks)
- ii. Predict the unit cost in an order of 8 of these glasses (2 marks)
- iii. To what extent does the number of lenses sold influences the cost per unit (4 marks)

Question Two (20 Marks)

- a) The age distribution of all players in the national teams in a certain country is shown below.

Age (Years)	20-24	25-29	30-34	35-39	40-44	45-49	50-54
No. of Players	11	24	30	18	11	5	1

- i. Determine the cut-off ages if 30%, 40% and 30% of the players must belong to Harambee, Malkia and Simba teams respectively (7 Marks)
 - ii. Use coefficient of skewness to examine whether age distribution exhibits normal distribution. (5 Marks)
- b) Production process of a manufacturing company is described by the polynomial function $f(x) = x^3 - 6x^2 + 9x + 1$ where x is the number of units produced.
- i. Evaluate the turning points of this production curve. (6 marks)

- ii. Hence or otherwise, determine the value of f (2 marks)

Question Three (20 Marks)

- a) Consider an economic system which has 2 different sectors, each of which produces one commodity. The product of one sector is being consumed by other sector. Also, there is the final demand for each product produced.

Required:

- Represent the above information in a tabular form (2 Marks)
- Derive the relationship (equation) to determine how much each industry should produce to meet the final demand (3 Marks)

- b) Economic surveys of suppliers and consumers of a popular commodity resulted to the following data

Price (Ksh. '000)	10	20	30	40	50	60
Demand ('000 units)	30	25	20	10	20	30
Supply ('000 units)	15	25	40	20	15	5

- Establish the demand and supply functions (6 Marks)
 - Determine the equilibrium price and quantity (4 Marks)
- c) Test the hypothesis that the average content of containers of a particular lubricant is 10 litres against not equal if the contents of a random sample of 10 containers are 10.2, 9.7, 10.1, 10.3, 10.1, 9.8, 9.9, 10.4, 10.3 and 9.8 litres. Use 0.01 level of significance and assume a normal distribution (5 marks)

Question Four (20 Marks)

- a) On January 1st this year, company A had 60% of its local market share while the other two companies B and C had 30% and 10% respectively of the market share. Based upon a study by a marketing research firm, the following facts were compiled. Company A retains 90% of its customers while gaining 5% of B's customers and 10% of C customers. Company B retains 85% of its customers while gaining 5% of A's customers and 7% of C's customers. Company C retains 83% of its customers and gains 5% of A's customers and 10% of B's customers. What will be each firm's market share for the following period:

- In two-time period (5 marks)
- At equilibrium (5 marks)

- b) In studying the association between two variables X and Y, a researcher obtained the following data:

$$\sum X = 25.7, \sum Y = 14.4, \sum XY = 46.856, \sum X^2 = 88.31, \sum Y^2 = 26.4324, n = 8$$

From the above information,

- i. Estimate the regression equation and sketch it (5 Marks)
- ii. Hence or otherwise, test the significance of the slope coefficient at 0.1 level of significance (5 Marks)

Question Five (20 Marks)

- a) During the ensuing change excitement, the city planning officer wishes to decide on the parking fee to be charged so as to maximize revenue collection. The officer, a management science graduate, has determined the following function which expresses the average number of cars (c) parked in the city council parking facilities per day as function of the parking fee (p) in Ksh.

$$q = 6,000 - 12p$$

Determine the fee that should be charged and the expected number of cars to maximize daily revenue generated from parking fees. (5 marks)

- b) A tea blender uses two types of tea, T1 and T2, to produce two blends, B1 and B2, for sale. B1 uses 40% of the available T1 and 60% of the available T2, whilst B2 uses 50% of the available T1 and 25% of the available T2.

Required:

- i. Given that t1 kilos of T1 and t2 kilos of T2 are made available to produce two blends, b1 kilos of B1 and b2 kilos of B2, express the blending process in matrix format. (2 marks)
 - ii. If 400 kilos of T1 and 700 kilos of T2 were made available for blending, what quantities of B1 and B2 would be produced? (3 marks)
 - iii. If 600 kilos of B1 and 450 kilos of B2 were produced, use matrix method to determine what quantities of T1 and T2 would be used to produce the blend. (4 marks)
- c) National Oils (NO) Ltd and Local Oils (LO) Ltd are competitors in cooking oils. They both pack cooking oil in 2kg cans but NO's cans have a standard deviation of 0.04kg and LO's 0.05kg. A can is considered reject if its weight falls below 1.93kg otherwise it is normal. NO sells its reject cans for KSh. 400 and normal cans for KSh. 490 while the respective prices for LO are KSh. 380 and KSh. 500.

Kim orders 1,000 cooking oil cans from NO and Joe the same number from LO. Calculate the total amount that each will pay. (6 Marks)