BOWEN UNIVERSITY, IWO
(OF THE NIGERIAN BAPTIST CONVENTION)
COLLEGE OF MANAGEMENT AND SOCIAL SCIENCES (COMSS)
BUSINESS ADMINISTRATION PROGRAMME
B.Sc. BUSINESS ADMINISTRATION DEGREE
2022/2023 SECOND SEMESTER EXAMINATION

COURSE CODE:	BUS 104
COURSE TITLE:	Mathematics for Management Sciences II
CREDIT:	3
TIME:	3 HOURS
INSTRUCTIONS:	ANSWER QUESTION 6 AND ANY OTHER 3 QUESTIONS
DATE:	JUNE 20, 2023

1. (a) By method of mathematical induction show that $1 + 3 + 5 + \ldots + k\text{-}1 = k^2$

    (3 Marks)

    (b) Brand switching is a common phenomenon in Business. What are the factors that influence brand loyalty **(3 Marks)**

    (c) Explain consumer surplus and producer surplus **(4 Mark)**

    (d) Simplify the following Surd expressions:

    (i) $\dfrac{7}{3 - \sqrt{2}}$ (ii) $\dfrac{7}{\sqrt{2} + \sqrt{5}}$ (iii) $\dfrac{3 + \sqrt{3}}{3 - \sqrt{5}}$ **(5Marks)**

2. (a) Alabi-Ziyad-Tamuno plc (Aka Alaziyata) has the following demand curve:

    $q = 200 - 4p$ for one of its products. Determine the price elasticity of demand for the product when:

    (i)   Price is N25   **(3 Marks)**

    (ii)   Price is N30   **(3 Marks)**

    (iii)   Price is N20   **(3 Marks)**

    (iv)   Comment on the elasticity of demand in each case   **(3 Marks)**

    (b) Find the square root of $11 - 6\sqrt{2}$ **(3 Marks)**

3. (a) Find the values of q if $\sqrt{3 + q} = q - 3$ **(3 Marks)**

    (b) Simplify the following complex numbers:

    (i)   16i + 30i (3-i)   **(2 Marks)**

    (ii) $\dfrac{5 + \sqrt{3i}}{1 + i\sqrt{3i}}$ **(4 Marks)**

(iii)   Use Argand diagram to represent 5 – 3i   (2 Marks)

(iv)   What is the relevance of Chapman-Kolmogorov Equation in Business?   (4 Marks)

4. A two sector economy has the following matrix of technological coefficients

$$A = \begin{bmatrix} 0.1 & 0.2 \\ 0.4 & 0.4 \end{bmatrix} \quad \text{and the final demand vector is } D = \begin{bmatrix} r \\ m \end{bmatrix}$$

Where r = last four digits of your matriculation number; and m = 2r .

(i)   Determine the industry output that will sustain this vector of final demand

                                                                          (6 Marks)

(ii)   Construct a table of flow of goods with a row of value added   (4 Marks)

(iii)   Indicate the relevance of matrix algebra to Business and Management Sciences

                                                                          (5 Marks)

5. A firm offers brand P telecommunication service and it currently has two major competitors, brands Q and R. the market shares as at July after an elaborate sales promotion were

Brand	Market Share
P	25%
Q	60%
R·	15%

A series of studies conducted on the operations of these key players revealed that telecommunications consumers' subscription behaviour can reasonably be represented by a Markov chain where monthly purchases depend on the last brand purchased. It is known that P retains 20% of its customers and loses 50% to Q and 30% to R. In the same vein Q retains 20% of its customers and loses 30% to A and 50% to R. Lastly, R retains 50% of its customers and loses 40% to A and 10% to Q.

Required:

(i) Obtain the transition probability matrix   (4 Marks)

(ii) Determine the market shares by (i) August (ii) September   (5 Marks)

(iii) Find the equilibrium markets shares   (6 Marks)

6. (a) Jamiu-Temi-Feyi-Dominion (Aka **JaTeFeDo**) is a monopoly firm. Its demand curve is given by

p$-$330+ 3q = 0 and its total cost function is: TC$-$ $2q^2 - 70q - 200 = 0$

   (i) Determine the quantity that minimises average cost   (4 Marks)

   (ii) Verify that when average cost is minimum, marginal cost equals average cost

                                                                            (3 Marks)

   (iii) Determine the price and quantity for which Revenue is maximised

                                                                            (3 Marks)

   (iv) Determine the price and quantity for which Profit is maximised   (5 Marks)

   (v) Verify that when profit is maximum marginal revenue equals marginal cost

                                                                            (3 Marks)

   (vi) The utility function of a consumer is given by   U   = f (X, Y)

   Specifically, U   = $X^{\frac{1}{2}} Y$

   Where X and Y are two commodity bundles

   The price of X is N20 and the price of Y is N50 and the consumer's budget is N1000.

   Formulate and solve the problem   (7 Marks)