BOWEN UNIVERSITY, IWO
College of Management and Social Sciences
Business Administration Programme
Second Semester 2021/2022 Examination

Level	: 100
Course Title	: Basic Mathematics for Management Sciences II
Course Code	: BUS 104
Credit	: 3
Instruction	: Answer Question 5 and any other 3 Questions
Time Allowed	: 2 Hours, 30 Minutes
Date	: Friday 22nd of July, 2022

1. (a) What is brand switching? (1 Mark) Why do people switch brands? (2 **Marks**)

(b)   Present a mathematical specification of Chapman-Kolmogorov equation for a finite Markov chain. What is it used for? (**2 Marks**)

(c)   Write your Matriculation number. Let A be a column vector of the last four digits of your matriculation number and A, a row vector of the last four digits of your matriculation number. Compute the product of A and B (**4 Marks**)

(d) If you decide to purchase an equipment in five years' time given, your knowledge of BUS104, what is the likely approach that will enable you raise the exact amount in five years' time assuming you do not intend to borrow? (6 Marks)

2. Awoniyi-Fola Plc (Aka **Awonila**) is a monopoly firm. Its demand curve is given by

$2p-56+q = 0$ and its total cost function is: $TC-2.5q^2 + 20q - 90 = 0$

   (i)   Determine the price and quantity for which Total Revenue is maximised. (**3 Marks**)

   (ii)   Determine the price and quantity for which Profit is maximised. (**4 Marks**)

   (iii)   Comment on your findings in (i) and (ii).   (**2 Marks**)

   (iv)   Verify that when profit is maximum, marginal revenue equals marginal cost. (**3 Marks**)

   (v)   Verify that when average cost is minimum, marginal cost equals average cost (**3 Marks**)

3. Write your first name, middle name and surname. Let R = first name, M = middle name and S = surname

(a) Use each letter of the three sets to describe a type of set. i.e., what type of set begins with each of the letters in your name? If there is none, write NT against the letter (**4 Marks**)

(b) Let U = {1, 2, 3, . . . 10}, A = last four digits of your registration number, B = 2A and P = set of prime numbers

(i)   List the elements in A, B and P (**1 Mark**)
(ii)   Find: (i) $A \cap B \cap P$ (**2 Marks**)
(iii) Show that $(A \cap B)^c = A^c \cup B^c$ (**4 Marks**)
(iv) Show that $(A \cup)^c = A^c \cap B^c$ (**4 Marks**)

4. Write your first name, middle name and surname.

(a) Use your first name to make a mathematical statement.   (**2 Marks**)
(b) Use your middle name to make a mathematical statement.   (**2 Marks**)
(C) Use your department to put up a valid argument and draw a logical conclusion that is valid. (**3 Marks**)
(d). By means of a truth table show that:

    (i) $(p \wedge q) \to (p \vee q)$ is a tautology; and   (**4 Marks**)

    (ii) $(p \wedge q) \wedge \sim (p \vee q)$ is a contradiction   (**4 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) 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   (**2 Marks**)

(ii) Determine the market shares by (i) August (ii) September (**4 Marks**)

(iii) Find the equilibrium markets shares   (**9 Marks**)

(b) 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**)

6. (a) Bolu owes Faith N25xyz due in six years and N 18byz due in two years. Will Faith be better off collecting N21400 from Bolu in three years' time assuming money is worth 20% compounded quarterly? xyz = last three digits of your matriculation number (**4 Marks**)

(b) Jokebe decides to make equal deposits to buy a piece of equipment in 5 years' time. The cost of the equipment is N35xy. Determine the amount of equal deposits required if money is worth 15% compounded monthly (**3 Mark**)

(c) Prepare a table of deposits (**3 Marks**) xy = last two digits of your matriculation number

(d) Assuming **Jasmine** takes a loan of N510xyz to buy an equipment. Determine the amount of equal payments if the loan is repayable in five equal instalments and money is worth 15% compounded monthly. (**3 Marks**) (ii) Prepare a table of Payment Schedule. Note: xyz = last three digits of your matriculation number (**2 Marks**)