MOSHOOD ABIOLA POLYTECHNIC

ABEOKUTA. OGUN STATE.

DEPARTMENT OF STATISTICS & MATHEMATICS

1st SEMESTER EXAMINATION

2023/2024 SESSION

COURSE TITTLE: **LOGIC AND LINEAR ALGEBRA**

COURSE CODE: **MTH 111**

LEVEL: **ND I** **COMPUTER SCIENCE (Full Time & Part Time)**

UNIT:**2**

TIME ALLOWED: **2HRs**

INSTRUCTIONS: **(i) Answer Question 1 and any other THREE (3) questions.**
(ii) Write ONLY your matriculation number on your question paper.

1. (a) What is Logic? (3 marks)

(b) Differentiate between Truth tables and Truth values. (3 marks)

(c) Let p be the statement "She is Bobrisky" and q be the statement "He is Okuneye Idris". Write each of the following compound statements in symbolic form using p and q.
(i) She is not Bobrisky but Okuneye Idris.
(ii) Only if he is not Okúneye Idris, is she Bobrisky.
(iii) She is not Bobrisky if he is Okuneye Idris, and she is not Bobrisky only if he is Okuneye Idris. (5 marks)

(d) Construct the truth tables for your answers in (c). (14 marks)

2. (a) Define the following permutations: (2 marks)
(i) Permutations of n distinct objects taken all n at a time. (2 marks)
(ii) Permutations of n distinct objects taken r at a time. (2 marks)
(iii) Circular permutations of n distinct objects. (2 marks)

(b) Find the values of n if ${}^{n}p_4 = {}^{n+1}p_3$ (10 marks)

(c) Find the value of n if ${}^{n+1}C_2 = 2 \cdot {}^{n}C_2$ (9 marks)

3. (a) Relate binomial expression, binomial function and binomial theorem. (5 marks)

(b) Prove that if n is an integer greater than 0, the expansion of the binomial function $(a+b)^n$ is $1 + nb + {}^{n}C_2 b^2 + \cdots + {}^{n}C_{n-1} b^{n-1} + b^n$ when $a = 1$. (10 marks)

(c) Expand $\left(1 + \frac{x}{3}\right)^{15}$ up to and including the term in x^3. (10 marks)

4. (a) Briefly explain the following:
(i) Order of a matrix (ii) Equal matrices
(iii) Negative of a matrix (iii) Multiplication of two matrices (12 marks)

(b) Find the values of a, b, c and d which satisfy the matrix equation

$$\begin{bmatrix} a+3 & 2b+a \\ c-1 & 4d-6 \end{bmatrix} = \begin{bmatrix} 0 & -7 \\ 3 & 2d \end{bmatrix}$$ (13 marks)

5. (a) The first three terms in the binomial expansion of $(1+ax)^n$ are $1 + 2x + \frac{5}{3}x^2$. Find the value of n and the value of a. (13 marks)

(b) Expand $\left(1 - \frac{y}{2}\right)^{-5}$. For what values of y is the expansion valid? (12 marks)

6. If $X = \begin{bmatrix} -3 & 1 \\ 1 & 0 \end{bmatrix}$, $Y = \begin{bmatrix} 2 & 1 \\ 3 & -1 \end{bmatrix}$ and $Z = \begin{bmatrix} 2 & -1 \\ 0 & 1 \end{bmatrix}$

(i) Find X^2 and Z^3.
(ii) Obtain $Z(X+Y)$ and $ZX + ZY$. Any observation? (25 marks)