COURSE CODE: MTH 101

COURSE TITLE: GENERAL MATHEMATICS I

2018/2019 ACADEMIC SESSION

DURATION: 2 Hours

INSTRUCTIONS:

1. YOU ARE TO ANSWER ANY **FOUR** QUESTIONS OUT OF **SIX** QUESTIONS ON THE EXAMINATION PAPER.
2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING THE EXAM
3. YOU ARE NOT ALLOWED TO BORROW CALCULATORS AND WRITING MATERIALS.

Question One

a) Derive the formula $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ from general quadratic equation $ax^2 + bx + c = 0$ using completing the square method. **(5 marks)**

b) If α and β are the roots of equation $2x^2 - 3x - 7 = 0$, find the value of $(\alpha + 1)(\beta + 1)$ **(3 marks)**

c) Solve for x and y in $2x + 3y = 1$ and $3 = 4y - 2x$ **(4 marks)**

d) Simplify $\dfrac{4(2^{n+1}) - 2^{n+2}}{2^{n+1} - 2^n}$ **(3 marks)**

Question Two

a If $\begin{pmatrix} y+z & 0 & 4 \\ 3 & 3x-y-z & 2 \\ x+y-3z & 6 & 5 \end{pmatrix} = \begin{pmatrix} 6 & 0 & 4 \\ 3 & -7 & 2 \\ -13 & 6 & 5 \end{pmatrix}$ find x, y and z **(6 marks)**

b) The first and last terms of a geometric series are 3 and 768 respectively. If the sum of the series is 1533. Find the number of terms and the common ratio. **(4 marks)**

c.) Find the sum of the first 2 terms of the G.P. $2, -6, 18, -54, \ldots$ **(3 marks)**

d) Calculate the sum to infinity of $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \frac{1}{81} + \ldots$ **(2marks)**

Question Three

a) In a class of 50 students, 37 study Biology, 25 study Geography while 10 study neither Biology nor Geography. (i) How many student study both Biology and Geography (ii) How many students study only Geography (iii) How many students study only Biology. **(6 marks)**

b) Let the universal set U be set of integers such that, U = $\{x: 0 < x < 10\}$
List the members of the following subsets
X = $\{prime\ numbers\ of\ U\}$
Y = $\{perfect\ squares\ of\ U\}$
Z = $\{numbers\ divisible\ by\ 2\ in\ U\}$
Hence find,

b) $U - X$
c) $(X' \cap Z') \cup Y$
d) $(X \cap Z) \cap (X \cup Z)'$

(9 marks)

Question Four

a) Expand $(3x+2a)^4$ using Pascal triangle. **(5 marks)**

b) Find the coefficient of y^4 in $(2x+3y)^5$ **(3 marks)**

c)The coefficient of the Fifth, Sixth and Seventh terms in the expansion $(1+x)^7$, in ascending power of x, form a linear sequence (A.P). Find the common difference. **(4 marks)**

d) What is the sum of 5^{th} and 6^{th} term of the sequence with nth term $n^3 - 2(n-1)$. **(3 marks)**

Question Five

a) Express $\cos 3\theta$ and $\sin 3\theta$ in terms of powers of $\cos\theta$ and $\sin\theta$ respectively.
(Hint: Using De Moivre's Theorem) **(5 marks)**

b) Write the expression $\frac{2+i}{5-2i}$ in the form $a+ib$ **(3 marks)**

c) Solve the equation $8^{\frac{x}{2}} = (2^{\frac{3}{8}})(4^{\frac{3}{4}})$ **(4 marks)**

d) Given that $\log_p 4 = x$ and $\log_p 5 = y$. Find $\log_p 100$ in term of x and y **(3 marks)**

Question Six

a) Resolve $\frac{x+3}{x(x^2+2)}$ into partial fraction **(5 marks)**

b) Prove that $\frac{2\cos^3\theta - \cos\theta}{\sin\theta\cos^2\theta - \sin^3\theta} = \cot\theta$ **(4 marks)**

c) Show that $\frac{\tan\theta}{\sec\theta} = \sin\theta$ **(3 marks)**

d) Find the value of $\begin{pmatrix} 2 & -3 & 1 \\ -1 & 1 & 2 \end{pmatrix}\begin{pmatrix} 1 \\ 6 \\ -2 \end{pmatrix}$ **(3 marks)**