BABCOCK UNIVERSITY, ILISHAN – REMO, OGUN STATE

DEPARTMENT OF BASIC SCIENCES

1ST SEMESTER EXAMINATION, 2014/2015 SESSION

MATH 101, GENERAL MATHEMATICS I

TOTAL MARKS: 60, **TIME ALLOWED:** 2 Hours

EXAMINER: Adio, A.K., Ayinde, S.A., Bamisile, O.O., Kanu, R.U., Mewomo, O.T.

INSTRUCTION: ATTEMPT ANY FOUR (4) QUESTIONS.

Question 1

a) If $\mu = \{4,5,6, \dots ,14,15\}$ and A,B and C are subsets of μ such that $A = \{multiples\ of\ 2\}$, B= $\{multiples\ of\ 3\}$, C= $\{multiples\ of\ 5\}$.

i. $A \cup B,\ A \cup C$ and $B \cap C$

ii. Use your result in (i) above to show that $(A \cup B) \cap (A \cup C) = A \cup (B \cap C)$ (5 marks)

b) At a sports club with 195 members, it was found that 90 played football; 76 played volleyball and 67 played basketball. 35 played both football and volleyball, 28 played both volleyball and basketball and 30 played both football and basketball; 35 did not play any of the three games. Determine the number of members who played:

i. All the three games

ii. Football only

iii. Volleyball and basketball but not football

iv. Neither football nor volleyball. (10 marks)

Question 2

a) Using completing the square method solve $ax^2 + bx + c = 0$, (5 marks)
hence use your result to solve $x^2 + 6x - 9 = 0$. (2 marks)

b) Determine the values of k in $x^2 + 3(k+3)x - \frac{9}{2}k = 0$, if it has equal roots. (4 marks)

c) If α and β are the roots of $2x^2 + 4x + 5 = 0$. Find the equations whose roots are $^1/_{2\alpha}$ and $^1/_{2\beta}$. (4 marks)

Question 3

a) Find the sum of the first twenty terms of an arithmetic progression of which the third term is 55 and the last term is -98. (5 marks)

b) Given that $\frac{1}{y-x}, \frac{1}{2y}$, and $\frac{1}{y-z}$ are consecutive terms of an arithmetic progression, prove that x, y and z are consecutive term of a geometric progression. (5 marks)

c) Find the sum of the first 6 terms of a geometric progression whose third term is 27 and sixth term is 8. (5 marks)

Question 4

a) Prove the following by mathematical induction

   i. That $3^n + 2n - 1$ is a multiple of 4. (4 marks)

   ii. That $9^n - 1$ is divisible by 8. ($3\frac{1}{2}$marks)

b) Prove by induction that 5+10+15+20+25+...+5n = $\frac{5n(n+1)}{2}$ for all possible values of n. ($7\frac{1}{2}$ marks)

Question 5

a) Simplify (i) $n!/n+2!$ (ii) $n!/(n-2)!$ (4 marks)

b) Expand $(2x-3y)^5$. Hence evaluate 1.97^5 (6 marks)

d) Obtain and simplify the term in the expansion $(2x^2 - y^3)^8$ which contains x^{10}. (5 marks)

Question 6

a) Find the modulus of the complex number $\frac{(1+i)(2+i)}{3-i}$ (5 marks)

b) Given the complex number $z = 3 + 7i$, show that $z\bar{z} = |z|^2$, where $\bar{z}$ denote the conjugate of z. (5 marks)

c) By using DeMoivre's Theorem, show that $cos3\theta = 4cos^3\theta - 3cos\theta$. (5 marks)