BABCOCK UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES; DEPARTMENT OF BASIC SCIENCES

SUMMER SEMESTER DEGREE EXAMINATION, 2013/2014 SESSION

COURSE CODE: MATH 101 **COUSE TITLE:** GENERAL MATHEMATICS 1

CREDIT UNITS: 3 **TOTAL MARKS:** 60

TIME ALLOWED: 2HRS **LECTURER:** KANU, R. U

INSTRUCTION: ATTEMPT FOUR QUESTIONS.

QUESTION ONE

(a) Let A, B and C is arbitrary non-empty sets. Prove that:

(i) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

(ii) $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

(b) In a class of 240 students, 144 offered Algebra, 130 offered Calculus and 106 offered Vector. If 20 of the students offered both Algebra and Calculus, 60 offered Algebra and Vector, 42 offered Calculus and Vector and each of the students offered at least one of the three courses. How many students offered:

(i) All the three courses?
(ii) Exactly two of the three courses?
(iii) Algebra only?

QUESTION TWO

(a) State the principle of mathematical Induction. [3 marks]]

(b) Use the principle stated in 2(a) to prove that

(i) $1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$ [6 marks]

(ii) $1 + 3 + 5 + \ldots + (2n-1) = n^2$ [6 marks]

for all positive Integers n.

QUESTION THREE

(a) If the equation $x^2 + 3(k+3)x - \frac{9}{2}k = 0$ has equal roots, find the possible values of k. [5 marks]

(b) If α, β are the roots of $x^2 - 7x + 10 = 0$, form the equation whose roots are $\alpha^3 and \beta^3$. [5 marks]

(c) If α, β are the roots of $x^2 - 12x + 7 = 0$, find the values of (i) $\alpha^2 + \beta^2$ (ii) $\frac{1}{\alpha} + \frac{1}{\beta}$ [5 marks]

QUESTION FOUR

(a) Define Sequence and Series [3 marks]

(b) The sum of an A.P is 40. If the first term is 16 and the common difference is 4, find the number of terms in the series. [5 marks]

(c) 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 terms of a geometric progression. [7 marks]

QUESTION FIVE

(a) Using the Binomial Theorem, expand

(i) $(2-3y)^4$

(ii) $(3-x)^5$

and simplify terms [10 marks]

(b) Find the 6th term in the expansion of $\left(x^3 - \frac{1}{2x}\right)^7$. [5 marks]

QUESTION SIX

(a) Let A and B be two arbitrary non-empty finite sets. Prove that

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$. [6 marks]

(b) If A and B are subsets of a universal set μ, prove that

$A - B = A \cap B'$ [5 marks]

(c) Show that $A \cup (A' \cap B) = A \cup B$, where A and B are the subsets of a universal set μ [4 marks]