BABCOCK UNIVERSITY

SCHOOL OF BASIC AND APPLIED SCIENCES

DEPARTMENT OF BASIC SCIENCES

COURSE CODE: MATH101 **COURSE TITLE: GENERAL MATHEMATICS 1**

TIME ALLOWED: 2HRS **TOTAL MARKS: 60**

DATE: 12/12/2013 **LECTURERS: Adelodun, J.F; AdioA. K; Kanu, R.U; Ayinde, S.A.**

ATTEMPT *FOUR* QUESTIONS ONLY

QUESTION ONE

(a) Let A and B be any non-empty arbitrary sets.

Define :

(i) $A \cap B$ (ii) $A \cup B$ (2marks)

Show that (iii) $A \cap B = B \cap A$ (iv) $A \cup B = B \cup A$ (3 marks)

(b) (i) Define cardinality of a set A. (1 mark).

(ii) If A and B are arbitrary non-empty finite sets, **show that**

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$. (4marks)

(c) (i) Let A be a non-empty subset of a universal set μ. Define the notion, complement of A... (2 marks)

(ii) Hence, if $\mu = \{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15\}$ and $A = \{1,3,5,7,9,11,13\}$, (3 marks)

Show that $(A')' = A$ and $A \cup A' = \mu$. $(A')'$

QUESTION TWO

(a) (i) State the principle of mathematical induction. (2 ½ marks)

(ii) Prove by mathematical induction that $9^n - 1$ is a multiple of 8 for all positive integral powers of n. (5 marks)

(b) Show by induction that

$$\sum_{r=1}^{n} \frac{1}{r(r+1)} = \frac{n}{n+1}$$

is true for all positive integers n. (7 ½ marks)

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 and β are the roots of $2x^2 + 4x + 5 = 0$, find the equations whose roots are:

(i) $\alpha - 1$ and $\beta - 1$ (3 marks)

(ii) α^2 and β^2. (3 marks)

(c) If α and β are the roots of the equation $px^2 + qx + r = 0$, find ,in terms of p, q a r ;the value of $\alpha^3 + \beta^3$. (4 marks)

QUESTION FOUR

(a) Find the number of terms in an Arithmetic progression whose first term is 5, common difference is 3 and the sum is 55. $-\frac{22}{3}$; 5 (5 marks)

(b) Find the sum of the first 6 terms of a Geometric progression whose third term is 27 and the sixth term is 8. 166.25 ; 33.25 (5 marks)

(c) The sum of the n terms of a progression is $2n^2 - n$. Find the nth term and show that the progression is an Arithmetic progression. (5 marks)

QUESTION FIVE

(a) Insert three geometric means between 3 and 48. (3 ½ marks)

(b) If the fifth term of a G.P. is 162 and the 8th term is 4374, find the sum of the first 10 terms. (4 marks)

(c) Sport club has facilities for Football, Basketball and Volleyball. An inquiry into the use of these facilities by the 274 members revealed the following information:

$n(F) = 130$, $n(B) = 59$, $n(V) = 106$, $n(F \cap B) = 40$, $n(B \cap V) = 9$.

$n(V \cap F) = 13$. If 38 members do not use any of these facilities at all:

(i) How many members use all the three facilities?

(ii) Determine (a) $n(F \cap V \cap B')$, (b) $n(F \cap B \cap V')$, and (c) $n(F' \cap B \cap V')$. (7½ marks)

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QUESTION SIX

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(a)(i) Expand $(2+x)^6$ in ascending powers of x. (4 ½ marks)

(ii) Hence, fin d the approximate value of $(2.01)^6$, correct to three places of decimals. $(2+0.01)^6$ (3 marks)

(b) (i) Using the Binomial theorem, expand $(1+x)^n$. (3 marks)

(ii) Hence, find the value of $\frac{1}{\sqrt{0.95}}$ correct to four places of decimals. (4 ½ marks)