BABCOCK UNIVERSITY

SCHOOL OF BASIC & APPLIED SCIENCES

DEPARTMENT OF BASIC SCIENCES

FIRST SEMESTER DEGREE EXAMINATION, 2012/2013

COURSE CODE: MATH 101 COURSE TITLE: GENERAL MATHEMATICS 1

CREDIT UNITS: 3 TOTAL MARKS: 60

TIME ALLOWED: 2HRS EXAMINERS: AYINDE, S.A., ADIO, A.K., KANU,R.U. & BAMISILE,O.C

INSTRUCTION: Attempt any FOUR questions

QUESTION 1

In a class of 60 students, 22 offered French, 22 offered English, 36 offered History, offered French and English, 10 offered English and History, 12 offered French and History while 6 did not offer any of the three subjects.

a) Use Venn Diagram to find the number of students who offered

(i) English and French only (3 marks)

(ii) Only one subject. (3 marks)

(iii) Exactly two subject. (3 marks)

b) Explain the following using Venn diagram

i. Difference of sets (2 marks)

ii. Compliment of a set (2 marks)

iii. Subset (2 marks)

QUESTION 2

a) Define a Venn diagram (1 mark)

Let A, B, C be arbitrary non empty sets. Then show that

i. $(A \cup B) \cup C = A \cup (B \cup C)$, (3 marks)

ii. $(A \cap B) \cap C = A \cap (B \cap C)$. (3 marks)

b) Distinguish between a sequence and a series (3 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. (5 marks)

QUESTION 3

(a) If the sum of the first 7 terms of an arithmetic progression is 28 and the sum of the first 15 terms is 90, find the sum of n terms. (6 marks)

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

(c) The 4th term of a geometric progression is 16 and the 8th term is 256. Find the first term, the common ratio and the sum of the first ten terms. (6 marks)

QUESTION 4

(a) If α and β are the roots of $x^2 - 7x + 10 = 0$. Form the equations whose roots are:

i. $3\alpha + \beta$ and $3\beta + \alpha$ (3 marks)

ii. $\alpha^3 + \beta^3$ $\quad a^3, \beta^3$ $(4\frac{1}{2}$ marks)

(b) i. Determine the values of k in $x^2 + (k - 2)x + (k + 1) = 0$, if it has equal roots. $(3\frac{1}{2}$ marks)

(b) ii. Show that $(p^2 + r^2)x^2 + 2(p + r)x + 2 = 0$ has no real roots, if p and r are unequal. (4 marks)

QUESTION 5

Prove by the method of mathematical induction that the following statements are valid for all positive integer n.

$n = k+1$ $\quad k+1 = n = 1$

$9^{k+1} - 1$

8^{k+1}

$8^n = 8$

a) $9^n - 1$ is a multiple of 8. (7 marks)

b) $\sum_{r=1}^{n} \frac{1}{(3r-2)(3r+1)} = \frac{n}{3n+1}$ (8 marks)

QUESTION 6

a) (i). Find the complete expansion of $(x + 3y)^5$. (6 marks)

(ii) Use the result of the expansion in a (i) above to determine the value of $(1.02)^5$ to 5 decimal places. (4 marks)

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