BABCOCK UNIVERSITY
SCHOOL OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF BASIC SCIENCES
FIRST SEMESTER EXAMINATION, 2016/2017

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

CREDIT UNITS: 3**TOTAL** **MARKS:** 60 **TIME** **ALLOWED:** 2 HOURS

INSTRUCTION: Attempt any **FOUR** questions

EXAMINERS: ADIO,A.K., KANU,R.U., AYINDE,S.A., BAMISILE,O.O., AKANBI,B.T.

QUESTION 1

At a Sport club with 63 members, 22 played Football, 25 played Basketball, 40 played Volleyball. 10 played Football and Basketball, 12 played Basketball and Volleyball, 15 played Football and Volleyball, 9 played Basketball only while 7did not play any of the three games.

a) Represent the above information using a Venn diagram (5 marks)

b) How many members played;

(i) Football and Basketball only (2 marks)

(ii) Only one game (2 marks)

(iii) Exactly two games (2 marks)

c) By simplification, show that $A \cap (A' \cup B) \cup B \cap (A' \cup B') = B$ where A and B are the subsets of the universal set μ (4 marks)

QUESTION 2

a) Prove that $(a^2 + b^2)x^2 - 3(a - b)x + \frac{9}{2} = 0$ has no real roots if $a + b \neq 0$ (5 marks)

b) Ifα and β are the roots of $2x^2 - x + 4 = 0$, find the values of;

(i) $\alpha^2 + \beta^2$ (2 marks)

(ii) $\alpha^3 + \beta^3$ (2 marks)

(iii) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ (2 marks)

c) If α and β are the roots of $2x^2 + 3x - 2 = 0$, form a quadratic equation whose roots are α^2 and β^2 (4 marks)

QUESTION 3

a) Find the 5^{th} term in the expansion of $(x^3 - \frac{7}{2x})^7$ (4 marks)

b) Expand $(x + 2y)^4$ in ascending powers of y. Hence, evaluate

$(1.02)^4$ (6 marks)

c) Find the first four terms of the expansion $(1-8x)^{\frac{1}{2}}$ in ascending powers of x. (5 marks)

QUESTION 4

a) In an Arithmetic progression; $a_5 = 1 \ and \ S_4 + S_{10} = 29$. Find the first term and the common difference. If $S_n = -120; \ find \ n.$ (6 marks)

b) The third term of a geometric progression is 27 and its sixth term is 8, find the sum of the first six terms of the progression. (4 marks)

c) A woman is offered a position at a starting salary of N46,000 per annum with annual increase of N2,500. How much would her total earnings amount to, if she were to work 12 years under this salary schedule?. (5 marks)

QUESTION 5

a) State the principle of Mathematical Induction. (3 marks)

b) Prove by induction that;

(i) $5 + 10 + 15 + 20 + 25 + \cdots 5n = \frac{5n(n+1)}{2}$ (6 marks)

(ii) $\sum_{b=1}^{n}(b+1)2^b = n(2^{n+1})$ (6 marks)

QUESTION 6

a)(i) Use anti symmetric law to show that $A \cup B = B \cup A$ (3 marks)

(ii) Find the possible values of k if $x^2 + (k-3)x + 4 = 0$ has equal roots. (3 marks)

b) Show that; (i) ${}^nC_r = {}^nC_{n-r}$ (ii) ${}^nC_n = {}^nC_0$ (3 marks)

c) The second term of a geometric sequence is 24, the fifth term is 81. Find the seventh term. (3 marks)

d) Prove by mathematical induction that $8^n - 1$ is a multiple of 7 (3 marks)