BABCOCK UNIVERSITY, ILISHAN-REMO
FIRST SEMESTER EXAMINATION 2008/2009
MATH 101: General College Maths. I
Instruction: Attempt Any three Questions

1a) Define the following terms:-
(i) power set (ii) cardinality of a set
(iii) difference of two sets (iv) disjoint set

b) Prove that if A, B and C are sets, then $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

c) 35 members of a faculty board went for snacks after a meeting. 27 ordered coke; 16 ordered meat pie; 12 ordered fish; 9 ordered fish and coke; 13 ordered meat pie and coke; 4 ordered fish and meat pie and 3 ordered all the 3 items.
How many ordered
(i) only coke (ii) only meat-pie
(iii) only fish (iv) How many staff members eat nothing

2a) Prove that $\sqrt{2}$ is not a rational number

b) State the principle of mathematical induction; hence show that for all positive values of n ; the statement
$1 + 3 + 5 + \ldots\ldots\ldots + (2n-1) = n^2$ is true

c) Find the 1st 6 terms of the sequence defined by $U_1 = 0$; $U_2 = 2$ and $U_r = U_{r-1} - U_{r-2}$ for $r > 2$. Hence evaluate $\sum_{r=3}^{7} U_r$

d) One root of the equation $px^2 + qx + r = 0$ is twice the other root. Show that $2q^2 = 9rp$

3a) The first term of an AP is $3p + 5$, where P is a +ve integer. The last term is $17p + 17$ and the common difference is 2.
Find in terms of P
(i) the no. of terms (ii) the sum of the series.
Show that, the sum of the series is divisible by 14; only when P is odd.

b) Find the coefficient of x^6 in the expansion of $\left(\frac{1}{x^2} - x\right)^{15}$

Expand $(3x-4y)^5$ Hence evaluate $(2.96)^5$ to 3 d.p.

Question 3:

(a) State the principle of mathematical induction. (3 marks)

(b) Use the principle of mathematical induction to prove that:

(i) $1^2 + 2^2 + 3^2 + \ldots + n^2 = \frac{n(n+1)(2n+1)}{6}$ is valid for all positive integers. (6 marks)

(ii) $9^n - 1$ is a multiple of 8 for all positive integral values of n. (6 marks).

Question 4:

(a) If the equation $x^2 + 3(p+3)x - \frac{9}{2} = 0$ has equal roots, find p.
(4 marks)

(b) Suppose the roots of the equation $3x^2 + 4x - 5 = 0$ are α and β. Find the values of
(i) $\alpha^2 - \beta^2$ and (ii) $\alpha^3 + \beta^3$ (6 marks)

(c) If one root of the equation $px^2 + qx + r = 0$ is four times the other, show that $4q^2 - 25pr = 0$. (5marks).

Question 5:

(a) Use binomial theorem to expand (i) $(2-3y)^4$ and (ii) $(3-x)^5$. Hence use (ii) to evaluate 2.98^5 to 4 significant figures. (9 marks)

(b) State De Morgan's laws and prove either of the two laws. (5 marks)

GOOD LUCK.