THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering & Technology

DEPARTMENT OF CIVIL AND BUILDING ENGINEERING

CERTIFICATE TECHNICIAN I

SEMESTER I EXAMINATION

APRIL/MAY 2010 SERIES

AH 2101 : ALGEBRA

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination:

- Answer booklet
- Graph paper
- Pocket calculator/Mathematical tables

This paper consists of **FIVE** Questions.
Answer Question **ONE** and any other **TWO** Questions.
Maximum marks for each part of a question are as shown.

Question ONE (30 Marks) COMPULSORY

(a). Show than:-

(i). $Log_{16}81 = \log_2 3$

(ii). $Log_{25}10 = \frac{1}{2}\log_5 10$

(iii). $Log_2 x + \log_3 x + \log_4 x = 6.977\log_{10} x$

(8 Marks)

(b). Solve the following equations:

(i). $2x^2 + 5x - 12 = 0$

(ii). $3x^2 - 4x - 1 = 0$

(iii). $\frac{x}{x-1} + 1 = \frac{x-2}{2x}$ **(14 Marks)**

(c). Use binomial theorene to evaluate $\frac{1}{3\sqrt{7.92}}$ correct to three decimal places.

(8 Marks)

Question TWO

(a). Use logarithms to evaluate:

$$3\sqrt{\frac{(4.72)^2 \times 4.56}{0.00913 \times (327)^2}}$$ **(7 Marks)**

(b). A parabola is defined by $y = ax^2 + bx + c$. Find the values of the constants a, b and c if the following pairs of x and y values lie on the curve: $(20 \ , \ 25)$; $(40 \ , \ 30)$; $(80 \ , \ 10)$. **(13 Marks)**

Question THREE

(a). Given the digits 0, 2, 4, 6, find:

(i). How many numbers can be formed using the digits, without repetition.

(ii). How many of the number in (i). above i.e. between 60 and 6000 (inclusive). **(9 Marks)**

(b). The first term of a G.P is 16 and this fourth -2. If the sum of the terms is $10\frac{2}{8}$, find the number of terms. **(11 Marks)**

Question FOUR

(a). Given the complex numbers $Z_1 = 3 - 2j$ and $Z_2 = 1 - 3j$, find:

(i). $Z_1 Z_2$ (ii). Z_1 / Z_2 (iii). Z_2^2 **(6 Marks)**

(b). If $Z_1 = [3 \ , \ 52°]$ and $Z_2 = [2 \ , \ 15°]$ in modulus argument form, find $Z_1 Z_2$. **(5 Marks)**

(c). Use De Moivre's theorem to solve the equation $Z^3 = 1$, giving your solution in the form $Z = a + bj$. **(9 Marks)**

Question FIVE

(a). The deflection of a circular beam is given by $y = KWL^3 / d^4$, where k is a constant, w thus load, L the length and d the diameter. Use binominal theorem to find the approximate percentage change in y when W is increased by 1½%, L by 1%, and d by 2%. **(7 Marks)**

(b). In an experiment to determine the law connecting compressive strength of a cement paste(s) and the water-cement ratio(x) the following results were obtained:

X	0.4	0.6	0.8	1.0	1.2	1.4
S	5850	3750	2450	1550	1000	650

If the law is of the form $S = A / B^x$, use graphical method to determine values for the constants A and B. **(13 marks)**