TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN BUILDING & CIVIL ENGINEERING
DIPLOMA IN ARCHITECTURE (DBCE 13S/DA 13S)

AMA 2150: ENGINEERING MATHEMATICS I

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination

- *Answer Booklet*
- *Scientific Calculator*

- *Mathematical Table*

This paper consists of **FIVE** questions. Answer any **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One

a) Solve the equation:

$$\log_4(x-1) = \log_4(x+1) + \frac{1}{2}$$

(5 marks)

b) Find the sum for the following progression:

$$13\frac{3}{4} + 11\frac{3}{4} + 9\frac{3}{3} + ...5\frac{3}{4} - 3\frac{3}{4}$$

(5 marks)

c) Three consecutive numbers forming a G.P has a sum 14 and their product is 64. Find the numbers **(5 marks)**

d) The sum of 3rd and 5th numbers for an AP is 8. The 8th term is twice the 4th term. Determine the 6th term. **(5 marks)**

Question Two

a) Sand is to be supplied weekly to a construction site in thousand tonnes forming the series; 950, 760, 608 and so on.

Find:

(i) Supply for the 10th week
(ii) Supply by the end of 7th week
(iii) The time when 10.95 thousand tonnes will be supplied to the site. **(8 marks)**

b) An experiment was performed suggesting a law of the form $y = cx^m$ (where c and m are constants). Results for the experiment were:

x	3.5	4.4	6.6
y	183	226	310

(i) Determine the law graphically
(ii) Find the value of y when x = 5 **(12 marks)**

Question Three

a) A contractor borrows kshs 400,000 and repays in 20 equal monthly installments at a simple interest of 15%. Find the total interest to be repaid if interest is determined on reducing balance **(8marks)**

b) (i) Find the 8th term in the binomial expansion of $\left(3-\frac{1}{2}\right)^{20}$

(ii) Expand $(8+0.4y)^{\frac{1}{3}}$ upto the term containing x^3

(iii) Using the expansion obtained in b(ii) evaluate $\sqrt[3]{64.4}$ by putting $y=\frac{1}{8}$ **(12 marks)**

Question Four

a) From first principles show that: $1+\tan^2 x=\sec^2 x$ **(4 marks)**

b) Solve the equation $\tan^2 x+\sec x=4 \quad 0^o \le x \le 360^o$ for **(7 marks)**

c) (i) Solve the equation $z^3-j+1=0$ giving the answer in the form a +bj

(ii) Represent the answer obtained in c(i) on a diagram **(9 marks)**

Question Five

a) Given $z_1=3j, \quad z_2=4-2j \quad z_3=-j+1$ find $\left|\frac{z_1\times z_2}{z_3}+z^6\right|$ **(10 marks)**

b) The forces act at a point in the same plane as shown in figure 1

Figure 1

(i) Use complex number method to find the resultant force

(ii) Determine the direction of application for the resultant **(10 marks)**