TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

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

AMA 2101: ENGINEERING MATHEMATICS I

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER/NOVEMBER 2013
TIME ALLOWED: 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
- *Answer Booklet*
- *Mathematical tables/Calculator*

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 equations:

$$\log_{31} x = \log_4\left(x^2 + \frac{1}{2}\right) + \frac{1}{2}$$

(i)

$$\log_5 x^2 = \log_5 y = 2$$

$$\log_5 x + \log_5 y = 3$$

(ii)   **(11 marks)**

b) A student builds blocks in rows such that each row contains one stock less than the row beneath. Find the brocks in the bottom row. State your assumptions   **(5 marks)**

c) Find the number of terms in the series   **(4 marks)**

$$8\frac{1}{3} + 7\frac{1}{3} + 6\frac{1}{3} \text{.......} 5\frac{1}{3}$$

(4 marks)

Question Two

$$y = px^q$$

a) The law relating the following data is thought to be of the form;   where p r q are constants.

x	1.6	2.6	3.9	6.4
y	2.5	3.2	4.1	5.4

(i)   Use graphical method to determine the law
(ii)   Find the value of y when x = 5   **(14 marks)**

b) Timber material is supplied monthly to a carpentry workshop in the following series in thousand tonnes:
          4200   + 840 + 1668 + …

     Find:

(i)   Supply in 8th month
(ii)   The period when 0.02 thousand tonnes will be required   **(6 marks)**

Question Three

a) Three times form G.P. Their sum is 14 and their product is 64. Find the numbers   **(8 marks)**
b) (i) Expand up to the term containing x3

$$\left(1 + \frac{1}{x}\right)^{\frac{-1}{3}}$$

(ii) Using the expansion obtained in b(i) find $\sqrt[3]{2}$ **(8 marks)**

c) Find 8th term in binomial expansion of $\left(2+\dfrac{1}{x}\right)^2$ **(4 marks)**

Question Four

a) (i) Solve $z^3 + 2j + 1 = 0$ giving the answer in the form $x + yj$
(ii) Represent the solution obtained in a(i) on a diagram **(12 marks)**

b) Solve the equation $3\cos x - 4\sin x = 1$ for $0 \le x \le 360^{\circ}$ by expressing $3\cos x - 2\sin x$ in the form $R\cos(x+\alpha)$

(8 marks)

Question Five

a) (i) Given $Z_1 = 2 + j$ $Z_2 = j$ and $Z_3 = 4 - zj$

Find $Z_y = \dfrac{Z_1 \times Z_2}{Z_3}$

(ii) Represent Z4 in a(i) on a sketch **(12 marks)**

b) Three forces act at a point in same plane as j $50N$ at $N40^{\circ}E, 100N$ at S60ºW and 150N at N60ºW.

Use complex number method to find the resultant force at the direction if with its acts.

(8 marks)