THE TECHICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

DIPLOMA IN ARCHITECTURE (DA 12S)
DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBC 12S)

AMA 2106: ALGEBRA

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: FEBRUARY 2013
TIME: 2 HOURS

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

- *Answer Booklet*
- *Scientific Calculator*
- *Mathematical Tables*

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) An assembly hall is designed to have 25 polygonal sides with length in an A.P and a perimeter of 1100m. The longest side is 10 times the shorted side. Determine the fifth side. **(5 marks)**

b) Due to improving technology, the cost of maintaining an excavator forms the following geometric series; k£800, k£480, k£288.

Find to the nearest k£

(i) The expected expenditure over the first 10 years

(ii) The total possible expenditure if the situation were to continue forever. **(5 marks)**

c) (i) Find the 10^{th} term in the binomial expansion of $\left(2+4\frac{x}{y}\right)^{15}$.

(ii) Expand $(1-8x)^{1/2}$ up to the term containing x^3

(iii) By putting $x=\frac{1}{100}$ in the expansion obtained in (c) (iii) determine the value of $\sqrt{23}$ correct to 4 decimal places. **(10 marks)**

Question Two

a) A contractor borrows Ksh. 45,000 and repays in 25 equal installments including 5% interest. Determine the total interest paid if the interest is calculated based on the outstanding balance. **(8 marks)**

$Z_1 = 3-2j,\ Z_2 = 1+4j \qquad Z_3 = 2-2j \qquad \frac{Z_1 \times Z_2}{Z_3}$

b) Given and evaluate in polar form. **(5 marks)**

c) A surveyor travels 15km 540°E followed by 50KM N60°E then 50km N30°E. Using complex number method determine:

(i) The distance the surveyor is from the starting point

(ii) The direction of the surveyor at the final station from the starting point **(7 marks)**

Question Three

a) Solve the following simultaneously:

$a+b+2c=-3$

$3a-2b+c=6$

$4b-3a-5c=6$

(5 marks)

b) Find the value of x which satisfies the equation:

$25^x - 5^{x+2} + 100 = 0$

(6 marks)

c) Expand $\frac{1}{\sqrt[4]{1-x}}$ up to the term containing x^3 and hence solve $\frac{1}{\sqrt[4]{80}}$ by putting $x = \frac{1}{81}$ in the expansion obtained. Give answer correct to 4 decimal places. (9 marks)

Question Four

a) Express $2\cos x + \sin x$ in the form $R\cos(x-\alpha)$. Hence solve $2\cos x + \sin x = 1$ for $0 \le x \le 360^o$

(8 marks)

b) (i) Solve the equation $z^2 + 8 = 0$ expressing the answer in the form $x + yi$

(ii) Represent the roots obtained in b(i) on an Argand diagram. **(12 marks)**

Question Five

a) The radius of a cylinder is measured 1% too low and the height 0.5% too high. Find the effect caused to the surface area. **(7 marks)**

b) A surveyor moves 30km S60°E followed by 50km N40°E and then 60km N30°W. Find using complex number:

(i) The distance the surveyor is from the starting point

(ii) The direction the surveyor is at the final point. **(8 marks)**

c) Solve $x^{-0.45} = 0.25$ using logarithms. **(5 marks)**