THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR DEGREE IN BACHELOR OF SCIENCE IN MECHANICAL/ELECTRICAL & ELECTRONIC/BUILDING & CIVIL ENGINEERING

SMA 2170/AMA 4101: ALGEBRA

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2012
TIME: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consist of **FIVE** questions in **TWO** sections **A** & **B**
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (30 marks- COMPULSORY))

a) Given that $\sqrt{2}=1.414$ and $\sqrt{3}=1.732$ evaluate $\dfrac{3\sqrt{2}-4}{\sqrt{3}-2\sqrt{2}}$ **(4 marks)**

b) Solve for x in the equation $x^{1.23}=0.12$ **(3 marks)**

c) What are the values of *a* and *b* if $x-3$ and $x+7$ are factors of the quadratic function $ax^2+12x+b$ **(5 marks)**

d) Evaluate $\dfrac{6^{1/2}\times 96^{1/4}}{216^{1/4}}$ **(4 marks)**

e) Find the sum and the product of the roots of the equation $\dfrac{1}{t}+\dfrac{1}{t+1}=\dfrac{1}{2}$ **(4 marks)**

f) Solve the quadratic equation $x^x-4x+29=0$ using the quadratic formula. **(5 marks)**

g) Obtain the expansion of $(1+x^2-2x)^8$ as far as the term in x^3 **(5 marks)**

Question Two (20 marks)

a) (i) State the remainder theorem. **(2 marks)**

(ii) The expression $px^4+qx^3+3x^2-2x+3$ has the remainder $x+1$ when divided by x^2-3x+2, Find the values of *p* and *q* **(7 marks)**

(iii) What is the value of *a* if $2x^2-x-6,\ 3x^2-8x+4$ and $ax^3-10x-4=0$ have a common factor? **(7 marks)**

b) Without using either tables calculators, evaluate.

$$\frac{12^{3/2}\times 16^{1/8}}{27^{1/6}\times 18^{1/3}}$$

(4 marks)

Question Three (20 marks)

$$1^3+2^3+.....n^3=\frac{1}{4}n^2(n+1)$$

a) Prove by induction **(7 marks)**

b) In arithmetic progression, the sum of the first five terms is 30, and the third term is equal to the sum of the first two. Write down the first five terms of progression.

c) Expand $(1+x)^{1/3}$ in ascending powers of *x* as far as the fourth term. By taking the first two terms of $x=\dfrac{1}{1000}$ the expansion and substituting find the value of $\sqrt[3]{37}$ correct to six significance figures $[h\text{int}\ \ 27\times 37=999]$

(3 marks)

Question Four (20 marks)

a) A given mass of air expands adiabatically and the following measurements are taken of the pressure (p cm of mercury) and volume (V)

V	100	125	150	175	200
P	53.6	42.4	32.8	27.0	22.3

$$P = KV^n$$

i) Reduce into linear **(2 marks)**

ii) Determine the values of the constants *k* and *n* **(10 marks)**

$$x\frac{2}{3} - 5x^{1/3} + 6 = 0$$

b) Solve the equation **(4 marks)**

$$\frac{x^2\left(1+x^2\right)^{-1/2} - \left(1+x^2\right)^{1/2}}{x^2}$$

c) Simplify **(4 marks)**

Question Five (20 marks)

a) Show that the roots of the quadratic equation $x^2 - 6x + 34 = 0$ are complex. What is the smallest integer that can be added to the above equation to get real number roots? **(7 marks)**

b) If the roots of the equation $x^2 - 5x - 7 = 0$ are α and β, find the equation whose roots are $(\alpha + 1, \beta + 1)$

. **(6 marks)**

$$\frac{3i - 2}{1 + 2i}$$

c) Express with real denominator **(3 marks)**

$$\log_{10}^{x} + \log_{10}^{y} = 1 \qquad x + y = 11$$

d) Solve the equations and **(4 marks)**