TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR DEGREE OF:

BACHELOR OF SCIENCE IN ELECTRICAL & ELECTRONIC ENGINEERING
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING
BACHELOR OF SCIENCE IN STATISTICS & COMPUTER SCIENCE
(BSEE. BSCE, BMAE, BMCS, BSSC)

AMA 4101/SMA 2170: ALGEBRA

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2014
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Mathematical tables*
- *Scientific Calculator*

This paper consist of **FIVE** questions
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 (Compulsory)

a) Given $Z_1 = 2 + j4$ and $Z_2 = 3 - j$ determine:

(i) $Z_1 + Z_2$

(ii) $Z_1 - Z_2$ and show the results on an Argand diagram **(6 marks)**

b) What is the smallest number of terms of the G.P 8 + 24 + 72 + --- that will give a total greater than 6,000,000? **(6 marks)**

c) Rationalize the denominator of $\frac{1}{5-\sqrt{3}}$ **(3 marks)**

d) Find the expansion of $\left(x-{}^{y}\!/_{2}\right)^{16}$ as far as the term containing y^4 **(4 marks)**

e) Solve by completing squares $ax^2+bx+c=0$ **(5 marks)**

f) Solve the following equation given that $\log_2(x+3)+\log_2(2x+7)=8$ **(6 marks)**

Question Two

a) If the second term of a G.P is $-{}^{1}\!/_{6}$ and the fourth term is $-{}^{1}\!/_{24}$, find the first term, the common ratio and the sum of the first 50 terms: **(10 marks)**

b) Solve $8^{3x+2}=5^{2x-7}$ **(5 marks)**

c) How many ways can a committee of 5 be selected from 8 men and 5 women if there must be a majority of women servying? **(5 marks)**

Question Three

a) If α and β are the roots of the equation $x^2-px+q=0$, Form the equation whose roots are $\frac{\alpha}{\beta^2}$ and $\frac{\beta}{\alpha^2}$

(8 marks)

b) State the remainder theorem and use it to obtain the remainder when $5x^4+2x^3+4x-115$ is divided by x + 3. **(5 marks)**

c) Evaluate (i) $\frac{2}{(1+j)^4}$ **(3 marks)**

(ii) $\left(\frac{1+j3}{1-j2}\right)^2$ **(4 marks)**

Question Four

$$\sqrt{(3x+1)} - (x+4) = 1$$

a) Solve the equation **(7 marks)**

$$\log_a b = \frac{1}{\log_b a}$$

b) Show that **(5 marks)**

c) A given mass of air expands adiabatically and the following measurements are taken of pressure (Pcm) and volume (Vcm^3):

V	100	125	150	175	200
P	58.6	42.4	32.8	27.0	22.3

Confirm that $P = KV^n$ and determine the values of the constant k and n **(8 marks)**

Question Five

$(0.97)^6$

a) Evaluate correct to 4 significant figures using the binomial expansion. **(6 marks)**

$$\log_3 x - 4\log_x 3 + 3 = 0$$

b) Solve for x **(10 marks)**

c) Find the least values of $13 + 6x + 3x^2$ **(4 marks)**