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:
BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY (BSIT 12J)
BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY (BTAC 12J)

SMA 2104/AMA 4106: MATHEMATICS FOR SCIENCE

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 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 (Compulsory)

a) Solve the following equations by the methods indicated:

$$x^2 + 2x - 8 = 0$$

(i)   by factorization   **(4 marks)**

$$2x^2 + 5x = 3$$

(ii)   by completing the square.   **(4 marks)**

$$2x + 2 = \frac{5x}{x-3}$$

(iii)   Formula (correct to 3 decimal places)   **(4 marks)**

b) Solve the following equations:

$$\log(x+1) + \log(x-1) = 2\log(x+2)$$

(i)

                                                                 (3 marks)

$$2^{x+1} = 3^{2x-5}$$

(ii)   (correct to 2 decimal places)   **(3 marks)**

c) In an experiment involving Newton's cooling, the temperature $\theta \; (^\circ C)$ is given by $\theta = \theta_o e^{-kt}$ find the value of the constant K when $\theta_o = 56.5^o$ and $\theta = 16.5^o$ and $t = 83.0$ seconds.   **(3 marks)**

d) Solve the equation:

$$x^3 - 7x - 6 = 0$$

                                                                  (6 marks)

e) If $A < 90 \; and \; \cos A = \dfrac{12}{13}$ find:

     (i)   Sin A

     (ii)   tan A in fraction form   **(3 marks)**

Question Two

a)   **(i)** Determine the value of 'a' if $(x+2)$ is a factor of $x^3 - ax^2 + 7x + 10$ **(3 marks)**

     (ii) Determine the remainder when $x^3 - 2x^2 + 6$ is divided by $x - 1$ and hence factorize the expression.   **(4 marks)**

b)   Given that: $Z = \sqrt{R^2 + \left(WL - \dfrac{1}{WC}\right)^2}$, transpose the formula to make C the subject and hence evaluate C when Z = 130, R = 120, W = 314 and L = 0.32.   **(5 marks)**

c) A tennis court measures 24m by 11m. In the construction of a court, an area of ground must be catered for as a boarder of constant width at the ends and sides of the court. If the total area of the court and it boarder is 950m2, find the width of the boarders.   **(5 marks)**

d) Solve the equation:

$$x^{3.2} = 41.15$$

                correct to 4 significant figures.   **(3 marks)**

Question Three

a) The first twenth and last term of an arithmetic progression are 4, 31.5 and 376.5 respectively. Determine:

    (i)   The number of terms in the series.   **(3 marks)**

    (ii)   The sum of all the terms.   **(1 mark)**

    (iii)   The 80th term.   **(1 marks)**

b) An oil company bores a hole 80m deep. Estimate the cost of boring if the cost is £30 for drilling the first metre with an increase in cost of £2 per metre for each succeeding metre. **(2 marks)**

c) If £100 is invested at compound interest of 8% per annum, find:

    (i)   The value after 10 years

    (ii)   The time, correct to the nearest year, it takes to reach more than £300.   **(3 marks)**

d) How many 5-digit even numbers greater than 40,000 can be formed with the digits 3, 4, 5, 6, 7, 0 without repetition of any digit? **(8 marks)**

Question Four

a) Determine the value of $(3.039)^4$ correct to 6 significant figures. **(7 marks)**

b) A botanical garden is constructed in a right-angled triangular shape with sides PQR as shown in figure 1 below:

Determine the lengths PR and QR and angle P. **(5 marks)**

c) Determine probabilities of having:

    (i)   At least one girl

    (ii)   At least one girl and 1 boy in a family of four children assuming equal probability of male and female birth. **(8 marks)**

Question Five

The acidity of a number of soil samples from a marshy area was determined and the results grouped as shown in Table 1.

pH	6.0 – 6.1	6.1 – 6.2	6.2 – 6.3	6.3 – 6.4	6.4 – 6.5	6.5 – 6.6	6.6 – 6.7	6.7 – 6.8	6.8 – 6.9
f	2	6	9	15	21	18	12	4	3

a) Draw a histogram for the data. **(4 marks)**

b) Determine:

    (i)   Mean PH of the data   **(7 marks)**

    (ii)   The standard deviation from the mean of the data   **(5 marks)**

    (iii)   The median for the data   **(2 marks)**

    (iv)   The mode for the data   **(2 marks)**