THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

PRECERTIFICATE IN INFORMATION TECHNOLOGY

AMA 1000: FUNDAMENTALS OF MATHS

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 **FOUR** printed pages

SECTION A (COMPULSORY)

Question One (20 marks)

a) Define the following terms as used in Mathematics:
- **i)** Naperian logs **(1 marks)**
- **ii)** Series **(1 mark)**

b) Transpose the Formular to make f the subject of the formula.

$$\frac{R}{r} = \sqrt{\frac{f+p}{f-p}}$$

(4 marks)

$$X = \frac{-b}{2a} \pm \sqrt{\frac{b^2 - 4ac}{2a}} \qquad a \neq 0$$

c) In quadratic equations, show that where **,** and hence solve the equation $5x^2 + 12x + 3 = 0$

(5 marks)

d) Solve for the unknowns in the following set of equations

$3x + 2y - z = 19$

$4x - y + 2z = 4$

$2x + 4y - 5z = 32$

(6 marks)

$$\log_2^x + \log_3^x + \log_4 x = 7.079 \log_{10} x$$

e) Show that **(3 marks)**

SECTION B (Answer any TWO questions from this section)

Question Two (20 marks)

a) Solve the following simultaneous equations

$7x - 4y = 23$

$4x - 3y = 11$

(4 marks)

b) Simplify the following, giving your answer without fractional indices. **(6 marks)**

$$F = \sqrt[3]{a^6 b^3} \div \sqrt{\frac{1}{9} a^4 b^6} \times \left(4\sqrt{a^6 b}\right)^{-½}$$

(6 marks)

c) (i) Find $\log_7 83.64$ **(4 marks)**

(ii) If $V = \frac{\pi h}{6}\left(3R^2 + h^2\right)$, determine the value of V when $h = 2.85,\ R = 6.24$ **(2 marks)**

d) Obtain the first four terms of $\left(1+\frac{1}{2}x\right)^6$ and use it to estimate the value of $(1.005)^6$. **(4 marks)**

Question Three (20 marks)

a) Solve the equation below

$5.4^{x+3} \times 8.2^{2x-1} = 4.8^{3x}$ **(5 marks)**

b) Determine whether or not the following set of equations can each be expressed as a product of linear factors.

i) $4x^2 + 3x - 4$ **(1 mark)**

ii) $6x^2 + 7x + 2$ **(1 mark)**

iii) $3x^2 + x - 4$ **(1 mark)**

iv) $7x^2 - 3x - 5$ **(1 mark)**

c) Solve the following pair of equations

$2(x + 2y) + 3(3x - y) = 38$

$4(3x + 2y) - 3(x + 5y) = -8$

d) The hypotenuse of a right angled triangle is 13cm. Find the length of other two sides if their difference is 7cm. **(5 marks)**

e) The sum of twice a number and its square is 48. Find the numbers. **(2 marks)**

Question Four (20 marks)

a) Show that the sum of n terms of a geometric series is given by $Sn = \frac{a\left(1-r^n\right)}{1-r}$ **(7 marks)**

b) given the series $2 + 4 + 8 + 16 + - - - -$, find

i) The common ratio r

ii) The sum of the first 5 terms **(4 marks)**

c) Insert 3 geometric means, A, B, C between 56 and 896. **(3 marks)**

d) The fourth term of an Arithmetic progression is 22 and the 7^{th} term is 40. Determine the first term, the common difference and hence the sum of the first 12 terms. **(5 marks**)

Question Five (20 marks)

a) Define the following terms:

i) Null matrix **(1 mark)**

ii) Order of a matrix **(1 mark)**

$$A = \begin{pmatrix} 5 & 8 \\ 2 & 5 \end{pmatrix}, \ \mathbf{B} = \begin{pmatrix} 2 & 6 \\ 3 & 3 \end{pmatrix}$$

b) Given the following matrices

Find (i) AB **(3 marks)**

(ii) A+3B **(3 marks)**

(iii) B^2 **(3 marks)**

$$A = \begin{pmatrix} 3 & 4 \\ 2 & 2 \end{pmatrix}, B = \begin{pmatrix} 6 \\ 5 \end{pmatrix}, C = \begin{pmatrix} 2 & 1 \\ 1 & 5 \\ 7 & 6 \end{pmatrix}$$

c) Given the matrices state the order of each of the matrices and hence state whether these matrices are compatible under multiplication. **(6 marks)**

d) Rationalize the following:

$$\frac{1}{3+\sqrt{2}}$$

(2 marks)

e) Express the following as roots of a single compound number.

i) $4\sqrt{3}$ **(1 mark)**

ii) $5\sqrt{7}$ **(1 mark)**