THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

DIPLOMA IN NAUTICAL SCIENCES

AMA 2102: MATHEMATICS FOR SCIENCE II

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER 2012
TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consist of **TWO** sections **A & B**

Answer **ALL** questions in section **A** and **THREE** questions in section **B**
Each question in section **A** carries **FOUR** marks while each question in section **B** carries **TWENTY** marks.
This paper consists of **THREE** printed pages

SECTION A (COMPULSORY)

Question One (30 marks)

$$O^o \le \theta \le 360^O$$

a) Solve the following equations for :

i) $5\sin\theta + 3 = 0$ **(4 marks)**

ii) $2 - 4\cos^2\theta = 0$ **(4 marks)**

iii) $\frac{1}{2}\cot^2\theta = 1.3$ **(4 marks)**

iv) $8\sin^2\theta + 2\sin\theta - 1 = 0$ **(4 marks)**

$$\sin\left(x + 60^o\right) + \sin\left(x + 120^o\right) = \sqrt{3}\ \cos x$$

b) (i) Show that **(4 marks)**

(ii) Solve the equation:

$4\sin\left(x - 20^o\right) = 5\cos x$

for values of x between 0^o and 90^o **(4 marks)**

$$\cot 2x + \cos ec 2x = \cot x$$

c) (i) Prove that **(4 marks)**

(ii) Prove the following identity

$$1 - \frac{\cot 2\theta}{\cos^2\theta} = \tan^2\theta$$

(4 marks)

d) (i) Solve, by method of substitution, the system of equations: **(4 marks)**

$3x - 2y = 12$

$x + 3y = -7$

$$\frac{1}{x+y} = \frac{4}{27},\ \frac{1}{2x-y} = \frac{4}{33}$$

(ii) Solve the system of equations **(4 marks)**

SECTION B (Answer any TWO questions from this section)

Question Two (20 marks)

$$0^o \le \theta \le 360^o$$

a) Solve the following equation for **(8 marks)**

b) Express $\cos 5t + \cos 3t$ as a product **(2 marks)**

c) Show that $\dfrac{\sin 4x - \sin 2x}{\cos 4x + \cos 2x} = \tan x$ **(6 marks)**

d) (i) Express in polar co-ordinates the position $(-4, 3)$ **(3 marks)**

(ii) Sketch the Argand diagram representing the point in d(i) **(1 marks)**

Question Three (20 marks)

a) Sketch the curve whose polar equation is $r = a(1 + 2\cos\theta)$ for $0^o \le \theta \le 360^o$ **(10 marks)**

b) Find the Cartesian equation of $r = a(1 + 2\cos\theta)$ **(6 marks)**

c) Find the polar equation of a circle whose Cartesian equation is $x^2 + y^2 = 4x$ **(4 marks)**

Question Four (20 marks)

a) Find the polar equation of a line such that the perpendicular to it from the origin is of length p and makes an angle α with the x-axis. **(3 marks)**

b) Plot the graph of the curve given parametrically by the equations.

$x = t^2 - 4$ and $y = t^3 - 4t$ for values of t from -3 to +3 **(10 marks)**

c) Find the Cartesian equation of parametric equations.

$x = \sin\theta \;\; y = \sin 2\theta$

(3 marks)

d) Obtain the parametric equations of the curve given by:

$y^2 = x^3 - x^2$

(4 marks)

Question Five (20 marks)

a) A point P is attached to a string of length 6cm whose ends are attached to two fixed points A and B, 4 on a part. Find the equation of the locus of P. **(5 marks)**

b) Find the equation of the locus of a point P which moves so that it is equidistant from two points A(3,2) and B(5, -1) **(5 marks)**

c) Find the equations of the tangents to the curve $xy = 6$ which are parallel to the line $2y + 3x = 0$ **(10 marks)**