TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

DIPLOMA IN NEUTICAL SCIENCE (DNSC 13M)

AMA 2205: MATHEMATICS II

END OF SEMESTER EXAMINATION
SERIES: APRIL 2015
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Mathematical Table*

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) Define the following terms as used in Mathematics:

(i) An equation

(ii) Sequence **(2 marks)**

b) Differentiate the following from first principles:

$y = x^2$

(i) **(3 marks)**

$y = \sin x$

(ii) **(5 marks)**

c) Insert 3 arithmetic means between 8 and 18 **(4 marks)**

d) Simplify the following:

J^{42}

(i) **(2 marks)**

J^{12}

(ii) **(2 marks)**

J^{11}

(iii) **(2 marks)**

J^{3}

(iv) **(2 marks)**

$$z = 4 + j3$$

e) Express the following in polar form **(3 marks)**

f) Solve for the unknown in the equations below:

$$\frac{2x-1}{5} + \frac{x-2y}{10} = \frac{x+1}{4}$$

$$\frac{3y+2}{3} + \frac{4x-3y}{2} = \frac{5x+4}{4}$$

(5 mark)

Question Two

a) State whether or not each of the following equations below can be expressed as a product of linear factors.

$2x^2 - 9x + 18 = 0$

(i) **(1 mark)**

$2x^2 + 11x + 28 = 0$

(ii) **(1 mark)**

$x^2 + 5x - 24 = 0$

(iii) **(1 mark)**

$x^2 - 4x - 21 = 0$

(iv) f

b) Integrate the following w.r.t x:

$$\int \frac{2x+3}{x^2+3x-5}dx$$

(i) **(4 marks)**

$$\int \frac{\ln x}{x}dx$$

(ii) **(2 marks)**

c) For the series 2 + 8 + 14 + 20 + …. Determine:

(i) U_{10} **(2 marks)**

(ii) S_{10} **(2 marks)**

d) The 4th term of an Arithmetic progression is 22 and the 7th term is 40. Determine the first term the common difference and hence the sum of the first 12 terms **(6 marks)**

Question Three

a) Draw an Argand diagram to represent the vectors:

$z_1 = 2 + j3$

(i) **(1 mark)**

$z_2 = -3 + j2$

(ii) **(1 mark)**

$z_3 = 4 - j3$

(iii) **(1 mark)**

$z_4 = -4 - j5$

(iv) **(1 mark)**

b) Solve for the unknowns below:

$$5(x+2y) - 4(3x+4z) - 2(x+3y-5z) = 16$$
$$2(3x-y) + 3(x-2z) + 4(2x-3y+z) = -16$$
$$4(y+2z) + 2(2x-4y-3) - 3(x+4y-2z) = -62$$

(8 marks)

c) Given that y = uv, where u and v are functions of x, show that:

$$\frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$$

(6 marks)

d) The 6th term of a geometric progression is 1214 and the 3rd term is 45. Determine the sum of the first 6 terms **(2 marks)**

Question Four

a) Transpose the following formular to make f the subject:

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

(6 marks)

b) Derive the quadratic formular and hence solve the following equation given below:

$2x^2 + 5x + 1 = 0$

(7 mars)

$$z_1 = r_1(\cos\theta_1 + j\sin\theta)_1,\ z_2 = 12(\cos\theta_2 + j\sin\theta_2)$$

c) Given that Show that

$z_1 \cdot z_2 = r_1 r_2(\cos\theta_1 + \theta_2) + j\sin(\theta_1 + \theta_2)$

(7 marks)

Question Five

$$x = a(\cos\theta + \theta\cos\theta),\ y = a(\sin\theta - \theta\cos\theta)$$

a) Given that , find:

(i) $\frac{dy}{dx}$ **(6 marks)**

(ii) $\frac{d^2y}{dx^2}$ **(3 marks)**

$$\int x^2 \ln x dx$$

b) Integrate the following w.r.t x: **(5 marks)**

c) Express the following in polar coordinates (4, -3) **(4 marks)**

$$pq^2 + rq + k = 0$$

d) Make q the subject of the formular below **(2 marks)**