



TECHICAL UNIVERSITY OF MOMBASA

# Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING  
DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBCE)  
DIPLOMA IN ARCHITECTURE (DA)

AMA 2214: ENGINEERING MATHEMATICS III

**END OF SEMESTER EXAMINATION**

**SERIES: APRIL 2013**

**TIME ALLOWED: 2 HOURS**

**Instructions to Candidates:**

You should have the following for this examination

- *Answer Booklet*
- *Mathematical Tables*
- *Scientific Calculator*

This paper consists of **FIVE** questions.  
 Answer any **THREE** questions  
 Maximum marks for each part of a question are as shown  
 This paper consists of **TWO** printed pages  
**Question One**

a) Evaluate the following:

$$\int_0^{\pi/4} \sec^2(x^2 + 1) \tan(x^2 + 1) dx$$

(i)

$$\int_1^3 t^2 \sin t dt$$

(ii)

(12 marks)

b) Find the area bound the functions  $y^2 = 4x$  and  $y = 2x^2$

(8 marks)

### Question Two

$$\frac{dy}{dx} + y \cot x = \cos x \quad y\left(\frac{\pi}{2}\right) = 0$$

a) Solve the equation given

(7 marks)

$$y = x^3 - 2x^2 - 8x$$

b) (i) Sketch the function

(ii) Find the area bounded by the function in b(i) and the x-axis

(13 marks)

### Question Three

$$(2x - y) \frac{dy}{dx} = 2x + 5y$$

c) Solve the equation

(8 marks)

d) (i) Find the area bounded by the function  $y = 1 + \cos \theta$  between  $0 = \frac{\pi}{4}$  and  $\theta = \frac{3}{4}\pi$  and the x-axis

(ii) The area in b(i) is rotated through 1 revolution about x-axis. Find volume for the solid generated. (12 marks)

### Question Four

$$\int_2^5 \frac{10x + 12}{x^2 + x + 11} dx$$

a) Evaluate:

(10 marks)

$$y = x^2$$

e) Find the x-ordinate for the position of centroid for the area bounded by the function  $y = x + 2$  and

(10 marks)

**Question Five**

$$\int \frac{2 + x + 6x^2 - 2x^3}{x^2(x^2 + 1)} dx$$

a) Evaluate **(9 marks)**

$$\int_0^{\pi/2} \sec^2(2\theta + 1) \tan(2\theta + 1) d\theta$$

b) Find **(6 marks)**

$$\int_0^{\pi/2} \sqrt{\left(1 - \frac{1}{3} \sin^2 x\right)} dx$$

c) Evaluate: using Simpson's Rule with 7 ordinates. **(5 marks)**