



# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

*Faculty of Engineering and Technology*

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

**DIPLOMA IN ARCHITECTURE (DA 10B)**  
**DIPLOMA IN CIVIL ENGINEERING (DC 10B)**  
**DIPLOMA IN BUILDING & CIVIL ENGINEERING (DBC 10B)**

AMA 2205: CALCULUS II

END OF SEMESTER EXAMINATION

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

**Instructions to Candidates:**

You should have the following for this examination

- *Answer booklet*
- *Mathematical tables*
- *Pocket Calculator*

This paper consists of **FIVE** questions

Answer question **ONE** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

## SECTION A (COMPULSORY)

### Question 1

a) Find:

(i) 
$$\int (3x + 4)^2 dx$$

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

(iii) 
$$\int (1 + \tan x)^2 dx$$

(10 marks)

b) Evaluate:

$$\int_0^2 \frac{2x^3}{(x^2 + 1)^2} dx$$

(10 marks)

c) Find the area bounded by the parabola  $y = x^2 - 7x + 6$  and the  $x$ -axis, using the Simpson's rule with 11 ordinates (10 marks)

## SECTION B (Answer any TWO questions from this section)

### Question 2

a) Use trigonometric substitution to find:

$$\int \frac{dx}{x^2 \sqrt{9 - x^2}}$$

(6 marks)

b) Use integration by parts to find:

$$\int x^2 \sin x dx$$

(7 marks)

c) Integrate by partial fraction:

$$\int \frac{dx}{x^2 - 4}$$

(7 marks)

### Question 3

$$\frac{d^2y}{dx^2} = x^2 - 1$$

- a) For every point of a certain curve,  $\frac{d^2y}{dx^2} = x^2 - 1$ . Find the equation of the curve if it passes through the point (1, 1) and is tangential to the line  $k + 12y = 13$  at that point (8 marks)

- b) Find the centroid of the first quadrant area bounded by the parabola  $y = 4 - x^2$  and the x-axis (12 marks)

#### Question 4

- a) Find the volume generated by revolving the plane area bounded by  $y = 2x^2$  and  $y = 2x + 4$  about the line  $x = 2$  (11 marks)

- b) Find the area bounded by the parabola  $y = 6x - x^2$  and the line  $y = 2x$  (9 marks)

#### Question 5

- a) Find the moment of inertia with respect to each coordinate axis of the area bounded by the curve  $y = \sin x$  and the x-axis from  $x = 0$  to  $x = \pi$  (15 marks)

- b) Find the moment of inertia with respect to its axis of the solid generated by revolving the area in the first quadrant bounded by the parabola  $y^2 = 8^x$ , the x-axis and the line  $x=2$  (5 marks)