



A Constituent College of Kenyatta University

**UNIVERSITY EXAMINATIONS 2012/2013 ACADEMIC YEAR**

**2<sup>nd</sup> YEAR EXAMINATION FOR THE DEGREE OF BACHELOR  
SCIENCE, BACHELOR OF EDUCATION SCIENCE AND BACHELOR OF  
ARTS**

**COURSE CODE/TITLE: SMA 200 : CALCULUS II EXAM**

**END OF SEMESTER: I**

**DURATION: 3 HOURS**

**DAY/TIME: THURSDAY 9.00 TO 12.00NOON DATE: 13.12.2012 (LTN/LTW)**

---

**INSTRUCTIONS TO CANDIDATES**

This paper consists of two sections: Section A and Section B. Answer **QUESTION ONE** and **any other TWO** questions from Section B.

**SECTION A ( 40 MARKS )**

**QUESTION ONE**

(a) Evaluate the following integrals :

$$(i) \int (x^2 + 3x)^2 dx \quad (ii) \int x^2 (x^3 - 7)^8 dx \quad (iii) \int_0^1 t \sqrt{3t^2 + 5} dt \quad (7 \text{ marks})$$

(b) Evaluate the following integrals :

$$(i) \int 2x(x^2 - 3)^2 dx \quad (ii) \int \frac{x dx}{\sqrt{6-x^2}} \quad (iii) \int_0^{\pi/2} \sin 5x \cos x dx \quad (10 \text{ marks})$$

(c) Find the length of the arc of the curve  $y^2 = 8x^3$  between  $x=1$  and  $x=3$ . (6 marks)

(d) Evaluate the following integrals, if they exist :

(i)  $\int_0^1 \frac{dx}{x^{\frac{3}{2}}}$       (ii)  $\int_1^{\infty} \frac{dx}{1+x^2}$       (iii)  $\int_0^2 \frac{dx}{x^2-1}$       ( 9 marks )

(e) (i) Use the trapezoidal rule with  $n = 4$  to approximate the value of the integral

$\int_0^1 \frac{16^x}{x+2} dx.$       ( 4 marks )

(ii) Use Simpson's rule with  $n = 4$  to approximate the value of the integral

$\int_0^2 \frac{dx}{x^3 - 9}$       ( 4 marks )

### SECTION B ( 30 MARKS )

Answer **any TWO** questions in this section

#### QUESTION TWO ( 15 MARKS )

(a) Find the area enclosed by the curve  $y = 4x - x^2$ , the  $x$ -axis and the ordinates at  $x = 0$  and  $x = 6$ .      ( 5 marks )

(b) The region bounded by the graphs of  $y = x^2$ ,  $x = 5$  and the  $x$ -axis is rotated about the  $x$ -axis. Find the volume of the solid of revolution.      ( 5 marks )

(c) The position of a particle at time  $t$  is given by  $x = \frac{1}{2} t^2 + 1$  and  $y = \frac{1}{3} (2t + 1)^{3/2}$ . Find the distance the particle travels between  $t = 0$  and  $t = 2$ .      ( 5 marks )

#### QUESTION THREE ( 15 MARKS )

Evaluate the following integrals:

(i)  $\int \frac{e^{\sqrt{x+1}}}{\sqrt{x+1}} dx$       (ii)  $\int_0^1 \frac{dx}{4+x^2}$       (iii)  $\int e^x \cos 3x dx$       (iv)  $\int \frac{dx}{(x-2)(x+1)}$

(v)  $\int_0^{\frac{\pi}{4}} \frac{\sin^3 x}{\cos x} dx$       ( 3 marks each )

QUESTION FOUR ( 15 MARKS )

(a) Evaluate the following integrals :

(i)  $\int_3^{\infty} \frac{1}{(x-2)^2} dx$ , using the change of variable  $x-2 = 1/u$  ( 4 marks )

(ii)  $\int_0^{\frac{2}{3}} \frac{1}{\sqrt{4-9x^2}} dx$  using the change of variable  $x = \frac{2}{3} \sin u$ . ( 4 marks )

(b) Using the trapezoidal rule with  $n = 4$ , compute an approximation to the integral

$\int_0^1 e^{x^2} dx$ . ( 4 marks )

(c) If  $\int_0^{\pi/2} x \sin x dx = \int_0^2 (ax^2 + 2x) dx$ , find the value of  $a$ . ( 3 marks )