

# MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)

University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

Second Year First Semester School Based (April-August 2016)

SMA 200: CALCULUS II

Date: .....

Time: .....

## Instructions to Candidates

Answer question ONE and any other TWO questions

### QUESTION 1: 30 MARKS (Compulsory)

a) Evaluate each of the following integrals:

i.  $\int (x^3 - 2x + 3) dx$  (2 marks)

ii.  $\int (9x - 2)^6 dx$  (3 marks)

iii.  $\int e^{\tan x} (\sec^2 x) dx$  (3 marks)

iv.  $\int \frac{x^2}{\sqrt{x^3+2}} dx$  (3 marks)

v.  $\int 7^{3x} dx$  (3 marks)

b) Resolve  $\frac{4-x}{(x-2)(x-3)}$  into partial fractions and hence determine  $\int \frac{4-x}{(x-2)(x-3)} dx$  (4 marks)

c) Use integration by parts to evaluate the integral

$\int x e^{ax}$  (4 marks)

d) Express  $2\sin 3x \cos 2x$  as a sum of two terms hence or otherwise evaluate the integral

$\int 2\sin 3x \cos 2x dx$  (4 marks)

e) Evaluate the definite integral:

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

**QUESTION 2 (20 MARKS)**

a) Work out the following integral:

$$\int_0^{\frac{\pi}{3}} (\cos 3x - 2 \sin x) dx \quad (5 \text{ marks})$$

b) Use partial fractions to evaluate the integral

$$\int \frac{5+x}{(1-x)(5+x^2)} dx \quad (5 \text{ marks})$$

c) Evaluate  $\int \frac{1}{3+4x^2} dx$  (5 marks)

d) Find the integral  $\int \frac{\sec^2 x}{\tan^3 x} dx$  (5 marks)

**QUESTION 3: (20 MARKS)**

a) Use integration by parts to evaluate

i.  $\int x^3 \ln x dx$  (5 marks)

ii.  $\int x^2 e^{2x} dx$  (8 marks)

b) Use appropriate technique to evaluate the integral

$$\int \sin^4 x dx \quad (7 \text{ marks})$$

**QUESTION 4 (20 MARKS)**

a) Use the fact that  $\sin^2 x + \cos^2 x = 1$  to evaluate the integral

$$\int \cos^3 x \sin^2 x dx. \quad (5 \text{ marks})$$

b) Use partial fractions to evaluate the integral

$$\int \frac{(x+1)}{x(x^2+2)} dx \quad (8 \text{ marks})$$

c) Evaluate the integral:

$$\int e^x \cos x dx \quad (7 \text{ marks})$$

**QUESTION 5 (20 MARKS)**

a) State the fundamental theorem of integral calculus. (2 marks)

b) Find the definite integral;

$$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \sec^3 x \tan x \, dx \quad (5 \text{ marks})$$

c) Find the area enclosed by the curves  $y = x^2$  and  $y = 2x + 3$ . (7 marks)

d) Calculate  $\int_1^{10} x^3 \, dx$  by trapezoidal rule, dividing  $x = 1$  to  $x = 10$  into nine intervals.

(6 marks)