



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

BRIDGING TO HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING

AMA 2405: CALCULUS II

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2012

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer Booklet/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 **THREE** printed pages
Question One (20 Marks)

a) Determine the area bounded by the function $\frac{2}{\sqrt{x}}$, x-axis and the line $x = 1$ and $x = 3$. Use trapezoidal rule with 5-ordinates. **(6 marks)**

b) Determine the following indefinite integrals.

i) $\int \cos 4x \, dx$ **(1 mark)**

ii) $\int (x^2 - 7)^9 x \, dx$ **(3 marks)**

iii) $\int \sin^2 x \, dx$ **(3 marks)**

iv) $\int_4^5 3x^2 \, dx$ **(2 marks)**

c) Express the following as partial fractions:

i) $\frac{11 - 3x}{x^2 + 2x - 3}$ **(3 marks)**

ii) $\frac{2x + 3}{(x - 2)^2}$ **(3 marks)**

Question Two (20 marks)

a) Evaluate the following definite integrals.

i) $\int_{-3}^2 (x + 2)^2 \, dx$ **(4 marks)**

ii) $\int 24 \sin^5 \theta \cos \theta \, d\theta$ **(4 marks)**

b) Integrate the following with respect to the variable.

i) $\int \frac{4x}{(x - 1)(x + 3)} \, dx$ **(5 marks)**

$$\int_0^3 \frac{x^3 - 2x - 4x - 4}{x^2 + x - 2}$$

ii)

(7 marks)

Question Three (20 marks)

- a) The areas of seven horizontal cross-sections of water reservoir of length 60m are measured at equal intervals are: 210, 250, 320, 350, 290, 230, 170m². Using Simpson's Rule, determine the capacity of the reservoir in litres. (5 marks)

$$y = x^2 + 4$$

$$x = 1 \quad x = 4$$

- b) The curve is rotated one revolution about x-axis between the limits and . Determine the volume of solid of revolution produced. (5 marks)

$$y = 5x - x^2$$

- c) Find the position of the centroid of the area bounded by the curve and the x-axis. (10 marks)

Question Four (20 marks)

- a) Evaluate the following integrals.

$$\int_{3.5}^{3.5} 4x^2 dx$$

i)

(3 marks)

$$\int_0^{\pi/4} x \sin 2x dx$$

ii)

(4 marks)

$$y = \frac{3}{1+x^2},$$

- b) Estimate using mid-ordinate rule with 8 intervals, the area bounded by the curve x=0 and x=2. Plot a graph of y-against x. (7 marks)

$$\int \sin^5 \theta d\theta$$

- c) Integrate with respect to the variable. (6 marks)

Question Five (20 marks)

- a) Solve the following hyperbolic functions. (10 marks)

$$\sinh 5.4$$

i)

$$\cosh 1.86$$

ii)

$$\tanh 0.52$$

iii)

$$\operatorname{cosech} 1.4$$

iv)

$$\operatorname{coth} 0.38$$

v)

- b) Evaluate: (6 marks)

$$\int e^x \cosh x \, dx$$

i)

$$\int \cosh 3x \, dx$$

ii)

$$\int x \sin hx \, dx$$

iii)

- c) Given that $Ae^x + Be^{-x} = 4 \cosh x - 5 \sinh x$. Determine the values of A and B. **(4 marks)**