



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of JKUAT)

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR BACHELOR OF SCIENCE IN ELECTRICAL &
ELECTRONIC ENGINEERING/MECHANICAL ENGINEERING/CIVIL ENGINEERING
BACHELOR OF TECHNOLOGY IN INFORMATION TECHNOLOGY
YEAR I, SEM II

SMA 2173: CALCULUS II

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: FEBRUARY/MARCH 2012

TIME: 2HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*

This paper consists of **FIVE** questions

Answer Question **ONE (Compulsory)** from **SECTION A** and any other **TWO** questions from **SECTION B**

Maximum marks for each part of a question are clearly shown

This paper consists of **THREE** printed pages

SECTION A (Compulsory)

QUESTION ONE (30 MARKS)

a) Find the derivative of the following

$$y = \tanh^{-1} x$$

i)

(4 marks)

$$y = \text{Coth}(\tan x)$$

ii)

(4 marks)

$$\tanh^2 x + \text{sech}^2 x = 1$$

b) Show that

(4 marks)

c) Evaluate

- i) $\int \frac{\cos\sqrt{x+1}}{\sqrt{x+1}} dx$ (5 marks)
- ii) $\int \sec x dx$ (5 marks)

- d) Express $2x^2 - 6x + 4$ in the form $a(u^2 \pm A^2)$ where a and A are real constants. Hence find $\int \frac{(x+1)dx}{\sqrt{2x^2 - 6x + 4}}$ (5 marks)

- e) Find the area of the region enclosed by the x-axis and one arc of the curve $y = \sin x$ (3 marks)

SECTION B (Attempt any TWO questions)

QUESTION TWO (20 MARKS)

- a) Find the arc length for the curve $y = x^2 - \frac{1}{8} \ln x$ taking $P_0(1,1)$ as the starting point (6 marks)

- b) i) Find the partial fractions for $\frac{8x^2 - 3x + 19}{(x^2 + 3)(x - 1)}$ (5 marks)

- (ii) Use the result in b) (i) above to evaluate $\int \frac{8x^2 - 3x + 19}{(x^2 + 3)(x - 1)} dx$ (4 marks)

- c) The area enclosed by the curve $y = 3e^{\frac{x}{3}}$, the x-axis and ordinates $x = -1$ and $x = 3$ is rotated 360° about the x-axis. Determine the volume generated (5 marks)

QUESTION THREE (20 MARKS)

- a) Find area of the surface generated by rotating the curve $x = \frac{1}{3}(y^2 + 2)^{\frac{3}{2}}$, $1 \leq y \leq 2$, about the x-axis (8 marks)

- b) Solve for x in $2.6 \cosh x + 5.1 \sinh x = 8.78$ correct to 4 decimal places (6 marks)

- c) $\int_2^3 \frac{x^3 - 2x^2 - 4x - 4}{x^2 + x - 2} dx$ correct to 4 significant figures (6 marks)

QUESTION FOUR (20 MARKS)

- a) Find the area of the region bounded on the right by the line $y = x - 2$, on the left by the parabola $x = y^2$, and below by the x -axis (4 marks)

$$\sinh x = -\frac{3}{4}$$

- b) Given that $\cosh x$. Find the value of

i) $\tanh x$ (3 marks)

ii) (2 marks)

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \sqrt{1 - \cos^2 t} dt$$

- c) Evaluate (6 marks)

$$y = x^3 + 2x^2 - 5x - 6 \quad x = -3 \quad x = 2$$

- d) Sketch the graph between and and determine the area enclosed by the curve and the x-axis (5 marks)

QUESTION FIVE (20 MARKS)

- a) Evaluate $\coth 0.38$ correct to 3 decimal places (4 marks)

$$\int_1^3 \frac{2}{\sqrt{x}} dx$$

- b) Calculate the error in approximating by trapezoidal rule with $n = 8$ (6 marks)

$$\int_0^{\frac{\pi}{3}} \sqrt{1 - \frac{1}{3} \sin^2 \theta} d\theta$$

- c) Evaluate correct to 3 decimal places using Simpson's rule with 6 intervals (4 marks)

$$\sinh 2$$

- d) Find the numerical value of correct to 2 decimal places. (2 marks)

$$\int \sin 3x \cos 5x dx$$

- e) Evaluate (4 marks)