



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS
UNIVERSITY EXAMINATION FOR THE
BACHELOR OF TECHNOLOGY IN INFORMATION TECHNOLOGY
(BTIT)

AMA 4202: CALCULUS II

SPECIAL/SUPPLEMENTARY EXAMINATION
SERIES: OCTOBER 2013
TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- Answer Booklet

This paper consist of **FIVE** questions in **TWO** sections **A & B**

Answer question **ONE (COMPULSORY)** 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 One

a) Given that:

$$\sinh x = -\frac{5}{12}$$

Find the value of
 $\coth x$

(3 marks)

$$\int_2^3 \frac{x^4 - 2x^3 - 4x^2 - 4x}{x^3 + x^2 - 2x} dx$$

b) Evaluate: (8 marks)

c) Find the volume generated by rotating the curve:

$$y = \frac{1}{3}(x^2 + 1)^{3/2} \quad 1 \leq x \leq 2$$

about the x-axis and

(6 marks)

d) Find $\frac{d^2y}{dx^2}$ if $x = 1 - t^2$ and $y = t - t^3$

(5 marks)

e) Find the derivative of the following.

$$xy + x^2y^3 = 5$$

(3 marks)

f) Using trapezoidal rule and taking $n = 6$ show that $\int_0^\pi 2 \sin^2 x dx = \pi$

(5 marks)

SECTION B (Answer any TWO questions from this section)

Question Two

a) Express $2x^2 - 6x + 4$ in the form $a(u^2 \pm A^2)$ where a and A are real constants. Determine u (4 marks)

b) Sketch the graph of $y = x^3 + 2x^2 - 5x - 6$ between $x = -3$ and $x = 2$ and determine the area enclosed by the curve and the x-axis. (7 marks)

c) Find the numerical value of $\coth 0.28$ correct to 3 decimal places. (3 marks)

d) Solve the equation $\frac{dy}{dx} = \frac{y^2 - 1}{x}$ (6 marks)

Question Three

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

b) Show that $1 - \tanh^2 x = \operatorname{sech}^2 x$ (7 marks)

c) (i) Evaluate $\int_2^3 \frac{Z+1}{(Z^2+5Z+4)} dz$ (4 marks)

(ii) Show that $\int \sec x dx = \ln(\sec x + \tan x) + c$ (4 marks)

Question Four

$$\int 2x\sqrt{1+x^2} dx$$

a) Find (5 marks)

b) Find the slope and the equation of the tangent to the curve $2x^2 + xy + 3y^2 = 16$ at the point (1, 2) (6 marks)

$$y = 3 \cosh\left(\frac{x}{3}\right)$$

$$\frac{d^2y}{dx^2} = \frac{1}{3} \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$$

c) Show that satisfy the differential equation (6 marks)

d) A curve passes through the point (3, -1) and its gradient function is $2x + 5$. Find the equation of the curve. (3 marks)

Question Five

$$\int x^2 e^x dx$$

a) Use integration by parts method, find (5 marks)

$$\frac{d^2y}{dx^2} \quad x = \cos 2t \quad y = \sin t \quad t = \pi/2$$

b) Find if at (7 marks)

$$y = \frac{x^2 - 3}{2x - 4}$$

c) Determine the asymptotes of the function (3 marks)

d) Find the surface area generated when the arc of the curve

$$x = 3t$$

$$x = 3t - t^3 \quad \text{between } t = 0 \text{ and } t = 1 \text{ rotates on x-axis through } 2\pi$$

(5 marks)