



TECHNICAL UNIVERSITY OF MOMBASA

*Faculty of Engineering & Technology in Conjunction with Kenya
Institute of Highways & Building Technology (KIHBT)*

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING ECONOMICS

EBE 3102: ENGINEERING MATHEMATICS II

END OF SEMESTER EXAMINATIONS

SERIES: APRIL 2014

TIME: 2 HOURS

INSTRUCTIONS:

- You should have the following for this examination:
 - Answer booklet
 - Mathematical table/scientific calculator
- Answer question **ONE (Compulsory)** and any other **TWO**.

This paper consists of Three printed pages.

QUESTION 1 (Compulsory)

a) Evaluate the following:

i) $\int_1^4 \frac{et}{4+e^t} dt$

ii) $\int x^2 \ln x dx$

marks)

(8

b) Find radius of curvature at the point $x = 1$ given function: $y = x^3 - \frac{1}{x} + \ln x + xy^2$

(12 marks)

c) Evaluate $\int \frac{8x}{(x^2 - 1)(x^2 + 1)} dx$

(10 marks)

QUESTION 2

a) Evaluate $\int \frac{2x^3 + 1}{x(x^2 - 1)} dx$

(10

marks)

b) Determine the radius of curvature for the function given as $x = \sin t$ $y = \cos 4t$ at the point where

$$t = \frac{\pi}{4}$$

(10 marks)

QUESTION 3

a) Evaluate $\int \cos 2t \sin 7t dt$

(7 marks)

b) Find partial fractions for $\frac{5x+2}{x(x^2+1)}$ and hence evaluate $\int \frac{5x+2}{x(x^2+1)} dx$

(13

marks)

QUESTION 4

a) Evaluate:

i) $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{2}{3} \sin t \cos^3 t dt$

ii) $\int \sqrt{x} \log_e x dx$

(9 marks)

b) Find the radius of curvature at the point where $x = 1$ for the function $y^2 = xy + \frac{1}{x}$

(11 marks)

QUESTION 5

a) Evaluate the partial fractions for:

$$\frac{4}{x^2 + 3x + 2} \quad \text{and hence evaluate } \int_1^3 \frac{4}{x^2 + 3x + 2} dx \quad (4 \text{ marks})$$

b) Evaluate $\int x^2 \cos x dx$ (8 marks)

c) Determine the radius of curvature at the point where $t = \frac{\pi}{8}$ for the function defined as:

$$x = \sin 2t \quad y = \cos 2t \quad (8 \text{ marks})$$