



TECHNICAL UNIVERSITY OF MOMBASA

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

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

HIGHER DIPLOMA IN ELECTRONIC ENGINEERING

EEA 3204: ENGINEERING MATHEMATICS IV

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: AUGUST 2014

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *A non-programmable Scientific Calculator*

This paper consists of **FOUR** questions. Answer any **THREE** questions

All questions carry equal marks

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One

- a) Define 2-transform (2 marks)

$$h\{n\} = \delta\{n\} + \frac{1}{6}\delta\{n-1\} - \delta\{n-2\}$$

- b) Find the zero's of (6 marks)

$$f(x) = \begin{cases} -1 & \text{if } -2 < x < 0 \\ 1 & \text{if } 0 < x < 2 \end{cases}$$

- c) Find the Fourier series of the function (6 marks)

Where $P = 2L = 4$, $L = 2$

$$\frac{x^2 + 1}{x^2 - 3x + 2}$$

- d) Resolve into partial fractions. (8 marks)

$$z = \cos 3x \sin 4y \quad \frac{\delta z}{\delta x} \quad \frac{\delta z}{\delta y}$$

- e) Given that find and (8 marks)

Question Two

$$\frac{1}{(4-x)^2}$$

- a) (i) Expand in ascending powers of x as far as the term in x^3 ; using the binomial expansion.
(ii) What are the limits of x for which the expansion in (a) is true. (12 marks)

$$\frac{\sqrt[3]{1-3x}\sqrt{1+x}}{\left(1+\frac{x}{2}\right)^3}$$

- b) Simplify given that powers of x above the first may be neglected. (8 marks)

Question Three

- a) Determine the Fourier series for the function defined by:

$$f(t) = \begin{cases} 1-t, & \text{when, } -\pi \leq t < 0 \\ 1+t, & \text{when, } 0 \leq t \leq \pi \end{cases}$$

Draw a graph of the function within and outside of the given range. (14 marks)

- b) Find the term representing the third harmonic for the periodic function of period 2π given by:

$$f(x) = \begin{cases} 0, & \text{when } -\pi \leq x \leq 0 \\ 1, & \text{when } 0 \leq x \leq \pi \end{cases}$$

(6 marks)

Question Four

$$z = \left(\frac{(x-y)}{(x+y)} \right)$$

a) If find:

$$\frac{\delta^2 z}{\delta x^2}$$

(i)

$$\frac{\delta^2 z}{\delta x^2}$$

(ii)

$$\frac{\delta^2 t}{\delta x \delta y}$$

(iii)

$$\frac{\delta^2 z}{\delta y \delta x}$$

(iv)

(16 marks)

b) Find: $\frac{\delta z}{\delta x}$ and $\frac{\delta z}{\delta y}$ given $z = x^3 - 2xy + y^2$

(4 marks)

Question Five

$$x(z) = \frac{z^3 + 2z^2 + 1}{z^3}$$

a) Find an inverse transform of:

(8 marks)

$$\frac{32x^2 - 8x - 1}{(x+4)(x+1)(2x-1)}$$

b) Resolve into partial fractions.

(12 marks)