



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND
ELECTRONICS ENGINEERING

MATHEMATICS V

DATE: 1/8/2016

TIME: 2:00 – 4:00 PM

INSTRUCTIONS:

Answer QUESTION ONE and Any other TWO Questions

QUESTION ONE

a) Given that $f(x) = \begin{cases} x & 0 < x < 2\pi \\ 0 & \text{elsewhere} \\ f(x + 2\pi) \end{cases}$

i) Sketch the function between $-4\pi < x < 4\pi$ (5 marks)

ii) Obtain the fourier series of the function (15 marks)

b) i) Derive the fourier series expansion expression (5 marks)

ii) Given that $f(x) = \{t^2 + t \quad -\pi < t < \pi$
 $f(t + 2\pi)$ (15 marks)

QUESTION TWO

a) Derive the fourier series coefficient for half range cosine for a period other than 2π
(5 marks)

b) A periodic function is defined by

$$f(t) = \begin{cases} t & 0 < t < 4 \\ -t & -t < t < 0 \\ f(t+8) \end{cases}$$

Obtain the fourier series

(15 marks)

QUESTION THREE

a) i) Derive fourier series coefficients for half range sine series with a period T.

(5 marks)

ii) Given $f(x) = \begin{cases} 3t & 0 < t < 1 \\ 3 & 1 < t < 2 \\ f(t+2) \end{cases}$ find the fourier series

(15 marks)

QUESTION FOUR

a) i) Given the polynomial $f(x) = x^3 + 2x^2 - 5x - 1$ prove that the newton Raphsons interpolation formulae is given by

$$x_{n+1} = \frac{2x^3 + 2x^2 + 1}{3x^2 + 4x - 5} \quad (4 \text{ marks})$$

ii) taking $x_0 = 1.4$ obtain a better approximation to the root of the equation $x^3 + 2x^2 - 5x - 1$ correct to four decimal places. (6 marks)

b) Given the table

x	1	2	3	4	5	6	7
F(x)	-3	1	11	33	73	137	231

i) Construct a finite table of differences (3 marks)

ii) Use the table to obtain the values of $f(2.8)$, $f(6.7)$ correct to three decimal places (7 marks)

QUESTION FIVE

A fourier series function is represented by

$$f(x) = \left. \begin{cases} 1 + \frac{x}{\pi} & -\pi < x < 0 \\ 1 - \frac{x}{\pi} & 0 < x < \pi \\ f(x + 2\pi) \end{cases} \right\} \text{ Obtain the fourier series} \quad (20 \text{ marks})$$