MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

THIRD YEAR FIRST SEMESTER EXAMINATION FOR

DIPLOMA IN CIVIL ENGINEERING

SUPPLEMENTARY EXAMINATION

CALCULUS III

DATE: 29/8/2017 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS

Answer question ONE (Compulsory) and any other TWO questions

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Use the maclaurins series to find the series for the following functions

i) $In\ (1+x)$ (5 marks)

ii) $In(1+3x)$ (5 marks)

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

ii) $f(x) = \{t^2 + t\}$ $\quad -\pi < x > \pi$

f (t+2π) (15 marks)

c) Using the maclaurins series of $(1+x)^n$ derive its binomial series

(5 marks)

QUESTION TWO

a) Given that $cos\ 60^0 = 0.5$ determine the value of $cos\ 70^0$ by taylors series

(5 marks)

b) Determine the value of $\int_0^1 \frac{\cos 2x}{x^{1/3}} dx$ correct to 2 decimal places.

(5 marks)

c) i) Derive fourier series co efficients for half range sine series with a period T.

(5 marks)

ii) Given $f(x) = \begin{Bmatrix} 3t & 0 < t > 1 \\ 3 & 1 < t > 2 \\ & f(t+2) \end{Bmatrix}$

find the fourier series expansion. (15 marks)

QUESTION THREE

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

$x_{n+1} = \frac{2x^3+2x^2+1}{3x^2+4x-5}$ (4 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 FOUR

A fourier series function is represented by

$$f(x) = \left\{ \begin{array}{ll} 1 + \frac{x}{\pi} & -\pi < x > o \\ 1 - \frac{x}{\pi} & 0 < x > \pi \\ & f(x + 2\pi) \end{array} \right\}$$

obtain the fourier series (20 marks)