MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

SPECIAL/SUPPLEMENTARY EXAMINATION FOR

DIPLOMA IN ELECTRICAL ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING

DIPLOMA IN CIVIL ENGINEERING

ECU0202: MATHEMATICS VI

DATE 25/9/2019 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS
QUESTION ONE (COMPULSORY) (30 MARKS)

a) Evaluate f(15)given the following table of values

x	10	20	30	40	50
F(x)	46	66	81	93	101

b) i) Derive the Newton Raphsons formula (5 marks)

ii) Use the formulae to prove that a better approximation to the root of the polynomial $4x^3 + 2x^2 - 200x - 50 = 0$ is given by

$$x_{n+1} = \frac{8x^3+2x^2+50}{12x^2+4x^2-200}$$ (10 marks)

iii) take$x_0 = 7$ to find the root of the equation correct to four decimal (5 marks)

c) Define the terms interpolation and extrapolation as used in numerical analysis (5 marks)

d) Obtain the maclaurins series of the function $f(x) = cos2x$

(5 marks)

QUESTION TWO (20 MARKS)

a) i) Given the polynomial $f(x) = x^3 - 6x^2 + 6x - 8$ prove that the newton Raphsons interpolation formulae is given by

$x_{n+1} = \frac{2x^3-6x^2+8}{3x^2-12x+5}$

ii) taking $x_0 = 5$ obtain a better approximation to the root of the equation $x^3 - 6x^2 + 6x - 8$ correct to four decimal place (9 marks)

b) Given the table

X	0	1	2	3	4	5	6
F(x)	-1	2	11	38	95	194	347

i) Construct a finite table of differences (4 marks)

ii) Use the table to obtain the values of f(4.8) , f(6.4) correct to three decimal places (7 marks)

QUESTION THREE

a) The table below satisfies a function f(x)

x	0.1	0.3	0.5	0.7	0.9	1.1	1.3
F(x)	0.003	0.067	0.148	0.248	0.370	0.518	0.697

Use the newton-gregory finite difference interpolation formulae to determine the value of f(0.15) (10 marks)

b) obtain the taylors series of the functions

i) $f(x) = \sinh 2x$

ii) $f(x) = e^{2x}$ (6 marks)

c) Find the cubic polynomial in x which takes on the values

-3,3,11,27,57, and 107 when the values of x=0,1,2,3,4and 5

(4 marks)

QUESTION FOUR (20 MARK)

a) Given that $x_1 = 3$ is an approximation to the $\sqrt{15}$ use iteration to find a better approximation to the root. (10 marks)

b) Given $x_{n+1} = 1.2345$ $x_{n+1} = 1.2447$

$x_{n+2} = 1.3124$ $x_{n+3} = 1.3233$

$f(x_{n)} = 12.5674$ $and\ f(x_{n+2}) = 13.9831$

Use linear interpolation and extrapolation to calculate

$f(x_{n+1})\ and\ f(x_{n+3})$ to 5 decimal places (10 marks)