MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS STATISTICS AND ACTUARIAL SCIENCE

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

DIPLOMA IN BUILDING AND CIVIL ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING

ECU 0202: ENGINEERING MATHS VI

DATE: 30/4/2019 **TIME: 8:30 -10:30 AM**

INSTRUCTIONS:

Answer Question ONE and any other TWO questions

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Obtain

i) the taylors series of the functions $f(x) = cos2x$ (3 marks)

ii) the maclaurin series of the function $f(x) = ln(1 + 3x)$ (3 marks)

b) Derive the Newton -Raphsons interpolation formula (7 marks)

c) i) Use the Newton Raphsons method to show that if x_n is an approximation to the root of the equation $4x^3 + 2x^2 - 200x - 50 = 0$ then the better approximation is given by

$$x_{n+1} = \frac{8x^3+2x^2+50}{12x^2+4x-200}$$ (5 marks)

ii) Hence take $x_0 = 7$ to find the root of the equation correct to four decimal places. (5 marks)

d) Use the taylors series to determine the power series for $sin(a + h)$ and hence determine the value of $sin\ 60.25^0$ correct to five decimal places (7 marks)

QUESTION TWO (20 MARKS)

a) A function $f(x)$ is defined by the data in the table below

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

Use the Newton Gregory forward difference interpolation formulae to estimate

i)$f(4.8)$ (5 marks)

ii) $f(6.4)$ (5 marks)

b) i) Given that x_n is an approximation to the root of the equation

$x^3 - 6x^2 - 6x - 8 = 0$ show using the Newton-Raphson method that a better approximation to the root is given by

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

ii) Hence by taking $x_1 = 5$ find the root of the equation correct to five decimal places. (10 marks)

QUESTION THREE (20 MARKS)

a) The values in the table below were obtained from an experiment

X	-0,5	0.0	0.5	1.0	1.5
F(x)	1.327	1.382	1.416	1.452	1.513

Use the newton Gregory forward difference interpolation formula to find the polynomial f(X) which corresponds to the values given above. Hence evaluate

i) $f(0.25)$

ii) $f(1.4)$ (10 marks)

b) Use the maclaurins theorem to obtain the power series for $cos2x$ and hence determine $\int_0^1 \frac{Cos\ 2x}{x^{1/2}}dx$ (10 marks)

QUESTION FOUR (20 MARKS)

a) Given that $x_1 = 3$ as an approximation to $\sqrt{10}$ use the iteration method to find a better approximation to the root. (5 marks)

b) Determine the taylors series of the function

$f(x) = e^{sinx}$ hence evaluate the value of $\int_{0,1}^{0.5} e^{sinx}dx$ (5 marks)

c) 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	0.379	0.518	0.697

Use the Newton-Gregory finite difference interpolation formulae to determine the value of $f(1.5)$ (10 marks)