CHUKA   **UNIVERSITY**

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ERSITY EXAMINATIONS

RESIT/SPECIAL EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS AND STATISTICS, GENERAL SCIENCE, BACHELOR OF EDUCATION IN ARTS/SCIENCE, BACHELOR OF ARTS MATHEMATICS AND ECONOMICS

MATH 323: NUMERICAL ANALYSIS 1

STREAMS: BED (ARTS, SCI) B.A (MATH, ECON) BSC (ECON STAT)

                                                              TIME: 2 HOURS

DAY/DATE: THURSDAY 04/02/2021   **2.30 P.M – 4.30 P.M**

INSTRUCTIONS:
Answer Question <u>ONE</u> and any other TWO Questions

QUESTION ONE (COMPULSORY)(30MARKS)

a. Evaluate $\int_{0}^{2}(x^2 + 4x - 1)dx$ with $h = 0.25$ using the Trapezoidal   (7Marks)

b. If exact value of x is $x_{exact} = 0.45606$ and the approximate value is $x_{approx} = 0.455$, find the absolute error, relative error and the percentage error   (6Marks)

c. Use the data to find Lagranges 2rd degree formula and use to find the value of y at $x = 1.5$

                                                              (5Marks)

x	0	2	3
f(x)	-4	2	14

d. Using the Secant method to find a root of $f(x) = x - Cosx$ to 6 decimal places given that $x_0 = 0$ and $x_1 = 1$ (6Marks)

e. Use the values in the table to estimate y at $x = 3.5$ use Newton's Backward difference interpolating formula   (6Marks)

x	0	1	2	3	4

y	7	10	13	22	43

QUESTION TWO (20MARKS)

a. Use Romberg's method to evaluate $\int_1^2 \frac{1}{x}\,dx$ correct to 4 decimal places by taking

   $h_0 = 0.5 \;\; h_1 = 0.25 \; and \; h_2 = 0.125$ (12Marks)

b. Find the cubic interpolation polynomial for the given data using Lagrange's interpolation formula hence evaluate $f(2.6)$ (8Marks)

x	1	2	3	4
f(x)	1.54	o.58	0.01	0.35

QUESTION THREE (20MARKS)

a. The table below shows the voltage drop (v) across a resistor for a number of different values of current (i)

i	0.25	0.75	1.25	1.75
v	-0.45	-0.60	0.70	1.88

   i.   Use the Newton's forward difference interpolating formula to find a cubic polynomial that best describes this data (8Marks)

   ii. Use the polynomial obtained in $5a(i)$ above to estimate the voltage drop for $i = 0.4$

   (2Marks)

b. Find the root of the equation $Sin\, x = 1 + x^3$ between $-2 \; and \; -1$ correct to 3 decimal places using Newton Raphson method with 5 iterations (10Marks)

QUESTION FOUR (20MARKS)

a. Consider the data in the table below

x	-3		-1	0	1	2	3
f(x)	-17	-25	-13	-5	-1	23	115

   i.   Construct the divided difference table for the data (5Marks)

ii. Using Newton's divided difference interpolation formula, obtain the polynomial for the given data based at $x_0 = -3$ (5Marks)

iii. Compute $f(-2.3)$ (2Marks)

b. Use the Bisection method to find the root of the equation $x^2 + 4x - 10 = 0$ to 6 decimal places between 1 and 2 with 5 iterations (8Marks)

QUESTION FIVE (20MARKS)

a. Compute $I_s = \int_{1.2}^{2.0} \frac{1}{2x^3 + 7} dx$ to 4 decimal places using Simpson's rule with 9 ordinates.

(10Marks)

b. Use the Regula Falsi method to compute the real root of the equation $Cos\,x = \sqrt{x}$ correct to 5decimal places (10Marks)