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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2023/2024 ACADEMIC YEAR
FOURTH YEAR, SECOND SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF BUSINESS INFORMATION TECHNOLOGY
KMA 2406 - NUMERICAL METHODS

Date: 11th August, 2023
Time: 8.30am – 10.30am

INSTRUCTIONS TO CANDIDATES
ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS
QUESTION ONE (30 MARKS)

a) Construct a forward difference table for the following data;

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

(4 Marks)

b) Evaluate $\sqrt[3]{12}$ using Newton Raphson method correct to 4 decimal places. (5 Marks)

c) Solve the following systems of equations using Gauss elimination method;

$$2x+3y-z=5$$
$$4x+4y-3z=3$$
$$-2x+3y-z=1$$

(4 Marks)

d) Solve $x^3-9x+1=0$ for the roots between x=2 and x=4 using bisection method.

(5 Marks)

e) The table given below shows the velocity v of a body during the time t. Find its acceleration at t=1.1.

t	1.0	1.1	1.2	1.3	1.4
v	43.1	47.7	52.1	56.4	60.8

(5 Marks)

f) Use trapezoidal rule to evaluate $\int_0^1 \frac{1}{1+x^2}dx$ given h= 0.25. (3 Marks)

g) Find the value of $f'(x)$ at the point $x=2$ from the following data;

x	1.5	3	6
f(x)	0.25	2	20

(4 Marks)

QUESTION TWO (20 MARKS)

a) Estimate the population for the year 2006 from the following data;

Year	1971	1981	1991	2001	2011	2021
Population (in thousands)	12	15	20	27	39	52

(6 Marks)

b) Obtain the first four iterations solutions of the following systems of equations using Jacobi 's method;

$$5x-2y+z=4$$
$$7x+y-5z=8$$
$$3x+7y+4z=10$$

(8 Marks)

c) Using Newton's divided difference formula, calculate the value of f(6) from the following data;

x	1	2	7	8
f(x)	1	5	5	4

(6 Marks)

QUESTION THREE (20 MARKS)

a) Estimate f (7.5) from the following data;

x	1	2	3	4	5	6	7	8
f(x)	1	8	27	64	125	216	343	512

(6 Marks)

b) Locate and correct the error in the following;

$$1,2,4,8,16,26,42,64,93$$ (6 Marks)

c) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ given the spacing of the values of x is 1 using;

i) Trapezoidal Rule (4 Marks)

ii) Simpson's one-third rule (4 Marks)

QUESTION FOUR (20 MARKS)

a) Find a cubic polynomial which takes the following data;

x	0	1	2	3
f(x)	1	0	1	10

(6 Marks)

b) Applying Lagrange's formula, find a cubic polynomial for the following data;

x	1	3	4
y	1	27	6

(6 Marks)

c) Obtain the first four iterations solutions of the following systems of equations using Gauss seidel method;

$$8x-3y+2z=20$$
$$6x+3y+12z=35$$

$4x+11y-z=33$

(8 Marks)

QUESTION FIVE (20 MARKS)

a) Construct a divided difference table for the following data;

x	1	2	4	7	12
f(x)	22	30	82	106	216

(6 Marks)

b) Find the real root of the equation $x^3-2x-5=0$ using Regula falsi method correct to three decimal places.

(6 Marks)

c) In an examination, the number of students who obtained marks between certain limits are as follows;

Marks	30-40	40-50	50-60	60-70	70-80
No. of Students	35	48	70	40	22

Find the number of students who secured marks not more than 45. (7 Marks)