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KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2022/2023 ACADEMIC YEAR
FOURTH YEAR, FIRST SEMESTER EXAMINATION
FOR THE BACHELOR OF BUSINESS AND INFORMATION TECHNOLOGY

SPECIAL EXAMINATION

KMA 2406 - NUMERICAL METHODS

Date: 9th December, 2022
Time: 11:30am-1:30pm

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

QUESTION ONE (30 MARKS)

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

b) Prove the following results:

i) $\delta E^{\frac{1}{2}} = \Delta$ (2 Marks)

ii) $E\nabla = \nabla E = \Delta$ (2 Marks)

iii) $\mu\delta = \frac{1}{2}(\Delta + \nabla)$ (2 Marks)

c) Find the root of the equation $x^3 - x - 1 = 0$ lying between 1 and 2 using bisection method. (5 Marks)

d) Find the missing values in the following table

x	0	1	2	3	4	5	6	7
y	1	-1	1	-1	1	---	----	-----

(4 Marks)

e) Solve the following systems of equations using Gauss elimination method

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

(3 Marks)

f) 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

(4 Marks)

g) Using trapezoidal rule evaluate $\int_1^2 \frac{1}{x}\, dx$ when $n = 5$. (3 Marks)

QUESTION TWO (20 MARKS)

a) The area A of a circle of diameter d is given for the following values:

d	80	85	90	95	100
A	5026	5674	6362	7088	7854

Find the area A given the diameter $d = 105$ (6 Marks)

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

$$5x - y + z = 10$$
$$2x + 4y = 12$$
$$x + y + 5z = -1$$

Start with $(2,3,0)$ (8 Marks)

c) Find the real root of the equation $x^2 - 5x + 2 = 0$ between 4 and 5 using Newton Raphson method

(6 Marks)

QUESTION THREE (20 MARKS)

a) Apply the Newton divided difference formula to evaluate f (8) given f (1) =3, f (3) =, f (6) =223, f (10) = 1011, f (11) = 1343 (7 Marks)

b) Using the Simpson's rule evaluate $\int_0^1 \frac{1}{x^2+1} dx$ given the spacing of the values of x is 0.1

(5 Marks)

c) Solve the following system of equations using Gauss-Seidel method;

$$10x + y + 2z = 44$$

$$2x + 10y + z = 51$$

$$x + 2y + 10z = 61$$

Obtain the first three approximations. (8 Marks)

QUESTION FOUR (20 MARKS)

a) Given that $y = x^3 + x^2 - 2x + 1$;

i) find the values of y for $x = 0,1,2,3,4,5$. (3 Marks)

ii) Form the difference table and find the value of y at $x = 6$ by extending the table. (5 Marks)

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

x	-2	-1	2	3
y	-12	-8	3	5

(6 Marks)

c) Locate and correct the error in the following functional values

x	1	2	3	4	5	6	7
y	2	5	10	18	26	37	50

(6 Marks)

QUESTION FIVE (20 MARKS)

a) Obtain the cubic polynomial for the following data:

x	0	1	2	3
y	1	0	1	10

(7 Marks)

b) The following table gives the distance in nautical miles of the visible horizon for the given heights in feet above the earth's surface.

x	100	150	200	250	300	350	400
y	10.63	13.03	15.04	16.81	18.42	19.9	21.27

Use Newton's forward formula to find y when x= 218 ft. (8 Marks)

c) Find the real root of the equation $x^3 - 2x - 5 = 0$ using Regula falsi method.

(5 Marks)