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(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2021 /2022 ACADEMIC YEAR
3RD YEAR FIRST SEMESTER
MAIN EXAMINATION

**FOR THE DEGREE OF BACHELOR OF EDUCATION
SCIENCE**

COURSE CODE: MAA 312

COURSE TITLE: NUMERICAL ANALYSIS 1

DATE: 19/05/2022

TIME: 2:00 PM - 4:00 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 4 Printed Pages. Please Turn Over.

QUESTION ONE (30 MARKS)

- (a) Define the term Number system (2 marks)
- (b) What is the general form of decimal system (2 marks)
- (c) Convert 7562_{10} to hexadecimal (6 marks)
- (d) Name to sources of errors (2 marks)
- (e) Solve $x^3 - 9x + 1 = 0$.for the roots between $x = 2$ and $x = 4$ by Bisection method (Perform six alliterations) (11marks)
- (f) Solve the equation $f(x) = 0$ where $f(x) = x^2 - 2$ using secant method (4 marks)
- (g) Use the Newton-Raphson iteration method to determine the root of the equation $x^3 - 4x^2 + x - 10 = f(x)$ Taking $x_0 = 4$ for $n = 0,1,2$ (3 marks)

QUESTION TWO (20 MARKS)

- (a) Use the numbers $x_0 = 2, x_1 = 2.5, x_2 = 4$ to find the 2nd interpolating polynomial for $f(x) = \frac{1}{x}$ (10 marks)
- (b) Give four properties of the operator E (4 marks)
- (c) Given $y_3 = 2, y_4 = 6, y_5 = 8, y_6 = 9$ and $y_7 = 17$ calculate $\Delta^4 y_3$ (6 marks)

QUESTION THREE (20 MARKS)

(a) Given

x	-4	-1	0	2	5
F(x)	1245	33	5	9	1335

- i. Set up the divided difference table (6 marks)
- ii. Determine the polynomial that interpolates the data (6 marks)
- (b) Using Newton divided difference formula find the values of $f(2), f(8)$ and $f(15)$ from the data below (8 marks)

x	4	5	7	10	11	13
F(x)	48	100	294	900	1210	2028

QUESTION FOUR (20 MARKS)

- (a) Evaluate $\int_0^{\pi/2} \sin x \, dx$ using (15 marks)
 - i. Trapezoidal rule
 - ii. Simpsons $\frac{1}{3}$ rule
 - iii. Simpsons $\frac{3}{8}$ rule

(b) From the following table find the missing Value

(5 marks)

x	2,	3,	4,	5,	6
$f(x)$	45.0,	49.2,	54.1,	—,	67.4

QUESTION FIVE (20 MARKS)

(a) Given a polynomial with the following data points

(20 marks)

x	1.0,	1.1,	1.2,	1.3,	1.4,	1.5,	1.6
$f(x)$	7.989,	8.403	8.781,	9.129,	9.451,	9.750,	10.031

Find $\frac{dy}{dx}$ and $x \frac{d^2y}{dx^2}$ at $x = 1.1$ and $x = 1.5$