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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**

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### **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 2<sup>nd</sup> 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  $x = 1.5$