(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2020/2021 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION AND BACHELOR OF SCIENCE

COURSE CODE: MAA 323

COURSE TITLE: NUMERICAL ANALYSIS

DATE: 8/10/2021 **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 2 Printed Pages. Please Turn Over.

QUESTION ONE (30 MARKS) (12 marks)

a) Solve using Doolittle method

$2x + y + 4z = 12$
$8x - 3y + 2z = 20$
$4x + 4y - z = 33$

(8 marks)

b) Find the Eigen values and Eigen vectors for the matrix given.

$$\begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$$

C) Given the IVP $u^I = t^2 + u^2, u(0) = 0$. Determine the first 2 non –zero terms in the series for $u(t)$ and hence get the value of $u(1)$. (7 marks)

(3 marks)

d) Check if the function is a natural spline.

$f(x) = 5\,x^3 - 3x^2 \quad -1 \le x < 0$
$\quad -5x^3 - 3x^2 0 \le x \le 1$

QUESTION TWO (20 marks)

Complete the largest Eigen value and Eigen vector using power series.

$$\begin{pmatrix} 1 & 3 & 2 \\ -1 & 0 & 2 \\ 3 & 4 & 5 \end{pmatrix}$$

QUESTION THREE (20 marks)

a) Use Picard's method for successive approximation to find the value of y when x given to be 0.1. Given that $y = 1$ when $x = 0$ and the differential equation is given as $\frac{dy}{dx} = 3x + y^2; y(0) = 1.$ (14 marks)
Find y when $x = 0.1$

b) Evaluate $\int_{-1}^{1}(1 - x^2)^{3/2} \cos x \, dx$ using 3 points Gauss Chebyshev method . (6 marks)

QUESTION FOUR (20 marks)

a) Construct the least squares approximation for the function given as $y = e^x$ [0,1] . (10 marks)

b) Obtain the cubic spline approximation for the following set of data. (10 marks)

x	0	1	2	3
f(x)	1	2	33	244

Hence interpolate at $x = 2.5$

QUESTION FIVE (20 marks)

Evaluate $\int_0^1 \frac{1}{1+x} \, dx$ using Gauss –legendre ;

i. 2 point
ii. 3 point
iii. 4 point formulae