(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

THIRD YEAR SECOND SEMESTER

MAIN EXAMINATION

FOR THE DEGREE OF BACHELOR OF SCIENCE

(MATHEMATICS)

COURSE CODE: MAT 324

COURSE TITLE: NUMERICAL ANALYSIS II

DATE: 06/08/18 **TIME:** 2 PM -4 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 3 Printed Pages. Please Turn Over.

Question one (30 Marks)

(a) State euler's theorem (2MkS)

(b) express $f(x) = 3x^2 + 2x + 4$ in a series of Chebyshev's polynomial of the 1st kind. (4Mks)

(c) Using the Gauss -Jordan method, find the inverse of $\begin{bmatrix} 1 & 1 & 1 \\ 4 & 3 & -1 \\ 3 & 5 & 3 \end{bmatrix}$ (14Mks)

(d) (i) write down the one point Gauss formula (1Mk)

(ii) using (i) above evaluate the integral $I = \int_1^2 \frac{2x}{1+x^4} dx$ (9Mks)

Question two (20 Marks)

(a) Test the consistency of the following system of equations using the Gauss elimination method

$$\begin{aligned} x_1 + 10x_2 - x_3 &= 3 \\ 2x_1 + 3x_2 + 20x_3 &= 7 \\ 9x_1 + 22x_2 + 79x_3 &= 45 \end{aligned}$$ (10Mks)

(b) Evaluate $\int_0^1 \frac{1}{1+X^2 dx}$ using Romberg method to 4 dp. Take h=0.5, 0.25, 0.125 (10Mks)

Question three (20 Marks)

(a) Evaluate the integral $\int_0^1 \frac{dx}{1+x}$ using Gauss three-point formula (12Mks)

(b) Compare (a) above with exact solution and find the absolute error. (5Mks)

(c) State the properties of the cubic spline. (3Mks)

Question four (20 Marks)

(a) Show that $f(xy) = x^2 + x^2 + xy$ satisfies Euler's theorem. (6Mks)

(b) Obtain the cubic spline approximation for the following data.

x	0	1	2
$f(x)$	-1	3	29

With $M_0 = 0, M_2 = 0$ hence interpolate at x=0.5, 1.5 (14 Mks)

Question five (20 Marks)

Solve the system of equations

$$4x_1 + x_2 - x_3 = 2$$
$$x_1 + 5x_2 + 2x_3 = -5$$
$$x_1 + 2x_2 + 3x_3 = -4$$

Using the Jacobi iteration method, use the initial approximations as$x_i = 1,2,3$ perform five iterations. (20Mks)