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(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR
THIRD YEAR SECOND SEMESTER
SPECIAL/ SUPPLEMENTARY EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
MATHEMATICS

COURSE CODE: MAT 324

COURSE TITLE: NUMERICAL ANALYSIS II

DATE: 08/10/18

TIME: 11.30 AM -1.30 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

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

$$\begin{aligned}x_1 + 10x_2 - x_3 &= 3 \\2x_1 + 3x_2 + 20x_3 &= 7 \\9x_1 + 22x_2 + 79x_3 &= 45\end{aligned}\quad (15\text{Mks})$$

- (b) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ using Romberg method to 4 dp. Take $h=0.5, 0.25, 0.125$ (15Mks)

Question two

- (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 three

- (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

- (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 $x=0.5, 1.5$

Question five

Solve the system of equations

$$\begin{aligned}4x_1 + x_2 - x_3 &= 2 \\x_1 + 5x_2 + 2x_3 &= -5 \\x_1 + 2x_2 + 3x_3 &= -4\end{aligned}$$

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