

American International University-Bangladesh

Faculty of Science and Technology

Department of Mathematics

MAT 3101 Numerical Methods of Science and Engineering (Section: All)

Midterm Examination Spring: 2021-22

Total Marks: 40 Time: 1.5 hours

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**Instructions: 1. Results using programmable calculator without showing necessary steps will not be accepted.**

**2. Sharing or borrowing calculators and any other materials with others are not allowed.**

**3. Marks are indicated in the right margin.**

**SHORT QUESTIONS TO BE COVERED**

1. Reduce the following system of linear equations to an equivalent system that is diagonally dominant.
2. Write the Gauss-Seidel iteration formula for the given system of linear equations:
3. Find the number of real and complex roots by using graphical method for

1. Show that the equation has a root in the interval
2. Estimate the root of the equation near the point using Newton-Raphson method once (to 3 decimal places).
3. State with reason whether the iterative formula will converge to the root of the equation near
4. What is the Jacobian matrix of the system of nonlinear equations
5. Write the structure of natural cubic spline function for the given set of data
6. Estimate the value of using linear spline for the given data as

**BROAD QUESTIONS TO BE COVERED**

1. Solve the following system of equations by the Gaussian elimination method with pivoting system, giving your answers to 2 decimal places.

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Write MATLAB syntax to solve the system of linear equations using backslash operator

1. Apply secant method **TWICE** to estimate the root of to 2 decimal places starting with . Write MATLAB syntax to find the root in using MATLAB command **fzero**
2. The nonlinear equation has a **triple** root near

. Find the root using Newton-Raphson method correct the 2 decimal places.

1. The equation has a root near . The following iterative formulae are suggested to estimate the root

(i) (ii) .

Explain with reason which of the above formula will converge faster to the given root. Apply fixed point iterative formula to **TWICE** to find the root to 2 decimal places.

1. Apply Newton Raphson method **ONCE** to the following system of nonlinear equations near to write the root to 3 decimal places

1. Apply Gauss-Seidel iterative method **TWICE** with the initial guess

to find the root of the following system of linear equations (to 2 decimal places)

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1. Write the natural cubic spline function for the given set of data Hence find the value of . Write MATLAB syntax “csape’

to find the values of .