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**Presidency University**

**Bengaluru**

**SCHOOL OF ENGINEERING**

**SUMMER TERM - END TERM EXAMINATION-AUG 2024**

**Date**: 13/08/2024

**Time**: 9.30AM-12.30PM

**Max Marks**: 100

**Weightage**: 50%

**Semester**: Semester IV

**Course Code**: MAT 2003

**Course Name**: Numerical Methods for Engineers

**Program**: B.Tech

**Instructions:**

1. *Read all the questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculators are permitted.*

**Part A**

**Answer any FIVE questions. (5Q x 4M= 20M)**

1. Identify the lower triangular matrix for the equations , and . Using LU decomposition method. (CO1) [Knowledge]
2. Compute the real root of the equation assuming . (correct it for 2 decimal places) (CO1) [Knowledge]
3. State the formula of Simpson’s 1/3 rule and Simpson’s 3/8 rule for the function with 13 ordinates (CO2) [Knowledge]
4. Identify using Lagrange interpolation formula for the following data, and (CO2) [Knowledge]
5. Construct the forward difference table for the following data. and (CO2) [Knowledge]
6. Identify using modified Euler’s formula if , and (CO3) [Knowledge]
7. Write formula for and from Runge-Kutta 4th order method. (CO3) [Knowledge]

**Part B**

**Answer any FIVE questions. (5Q x 10M= 50M)**

1. Obtain the solution of the system of equations using Gauss-Seidel method. Correct to four decimal places and carry out 2 iterations.

(CO1) [Comprehension]

1. Identify the root of the equation lies between 1 and 2. Find the real root by the Newton-Raphson method, and carry out 3 iterations only. (CO1) [Comprehension]
2. Use the appropriate interpolation formula to estimate the value of at and for the following:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 1939 | 1949 | 1959 | 1969 |
|  | 15 | 20 | 27 | 39 |

(CO2) [Comprehension]

1. Compute at using (i) Newton’s Divided difference formula (ii) Lagrange’s interpolation formula for the following data.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 1 | 2 | 4 | 7 |
|  | 22 | 30 | 82 | 106 |

(CO2) [Comprehension]

1. Compute for , y(0) = 1, with step length 0.3 using Modified Euler method. (correct it to four decimal places and 7 modifications). (CO3) [Comprehension]
2. Compute Runge-Kutta method of 4th order for 𝑦(0.1), 𝑦(0.2) given that , 𝑦(0) = 1. (carry out computations correct to 4 decimal places). (CO3) [Comprehension]

**Part C**

**Answer any TWO questions. (2Q x 15M= 30M)**

1. Apply LU decomposition method to solve the equations: . (CO1) [Application]
2. Evaluate using (i) Trapezoidal rule (ii) Simpson’s 1/3rd rule (iii) Simpson’s 3/8th rule (considering seven ordinates and approximate for four decimal places) (CO2) [Application]
3. Solve Modified Euler’s method to find 𝑦 (0.15) given by taking ℎ = 0.05. (carry out computations correct to 4 decimal places) (CO3) [Application]