24 TRIBHUVAN UNIVERSITY INSTITUTE OF ENGINEERING

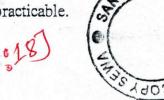
Examination Control Division

2070 Bhadra

| Exam. | 新江 1000 1000 1000 1000 1000 1000 1000 10 | Regular " | · . |
|-------------|---|------------|--------|
| Level | BE | Full Marks | 80 |
| Programme | BEL, BEX, BCT, B.Agri. | Pass Marks | 32 |
| Year / Part | II / II | Time | 3 hrs. |

Subject: - Numerical Method (SH553)

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- √ Attempt All questions.
- ✓ The figures in the margin indicate Full Marks.
- ✓ Assume suitable data if necessary.



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- Define error. Explain different types of errors in numerical computation.
- 2 Find a real root of the following equation correct to four decimals using False Position method.

$$e^{\cos x} - \sin x - 1 = 0$$

- 3. Discuss the limitations of Newton-Raphson method while finding a real root of a non-linear equation.
- 4. Solve the following system of equations using LU factorization method.

$$5x_1 + 2x_2 + 3x_3 = 31$$

 $3x_1 + 3x_2 + 2x_3 = 25$
 $x_1 + 2x_2 + 4x_3 = 25$

- 5 Write an algorithm for solving a system of linear equations of 'N' unknowns using Gauss-Jordan Method.
- 6. Find y at x = 8 from the following data using Natural Cubic Spline interpolation.

| x | 3 | . 5 | 77 | 9 |
|---|---|-----|----|---|
| у | 3 | 2 | 3 | 1 |

7. Fit the following set of data to a curve of them form $y = a b^x$. Also evaluate y(7).

| x | 2 | 4 | 6 | 8 | 10 | 12 |
|---|------|------|-----|-----|-----|-----|
| у | 16.0 | 11.1 | 8.7 | 6.4 | 4.7 | 2.6 |

8. Evaluate the following integral using Romberg method.

$$\int_{0}^{2} \frac{e^{x} + \sin x}{1 + x^{2}} dx$$

9. Determine y'(1) and y"(1) from the following data.

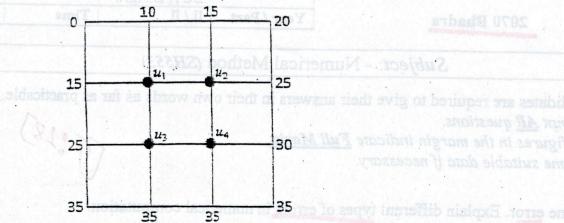
| X | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 |
|---|-----|-----|-----|-----|-----|
| У | 6 | 3 | 2 | 1.2 | 0.8 |

Solve the following initial value problem for y(1.2) using the Runge-Kutta fourth order method.

$$y'' - 3y' + y = \sin x$$
; $y(1) = 1.2$; $y'(1) = 0.5$

Write an algorithm to solve two point boundary value problem using shooting method.

12. Solve $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary conditions as shown in figure below.



a real root of the following equation correct to four decimals using Faise Position

$$0 = 1 - x \operatorname{mis} - x \operatorname{m}$$

as the limitations of Newton-Raphson method wishe finding a real root of a

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$$c_1 + 2x_2 + 4x_3 = 25$$

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y at x = 8 from the following data using Natural Cubic Spline interpolation.

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| 10 12 | | 2 L x . 1 |
|-----------|--------------|-----------|
| 4.7 2.6 | 11.1 8.7 6.4 | 0.01 y |

hate the following integral using Romberg method.

$$\int_{1-x^2}^{2} e^x + \sin x \, dx$$

amine v'(1) and y"(1) from the following data.

| 7.5 | | 0.1 | ₹.0 | X |
|-----|-----|-----|-----|---|
| | C-1 | £ 1 | | |

ve the following initial value mobiem for v(1.2) using the Runge-Kutta fourth order

an algorithm to solve two point boundary value problem using shooting method