13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Baisakh

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| Exam. | [redacted] | | |
| Level | BE | Full Marks | 80 |
| Programme | BGE, BEL, BEN, BCT, BAC | 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.*

1/[98]

NM Applicatrons

1. What are the applications of Numerical Method in engineering and science? Discuss it. [4]
2. Write an algorithm of Secant method to calculate the roots of a nonlinear equations $f(x) = 0$. Write the differences between secant and the false position methods. [4+2]
3. Find a real root of the equation $x\log_{10}x = 1.2$ by N-R method correct up to 4 decimal places. [6]
4. Write the pseudo code of the Gauss Jordan method to solve the linear system $Ax = b$. [8]
5. Find the dominant eigenvalue and eigenvector of the matrix: [8]

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$



6. Estimate y(6.5) using Natural cubic spline interpolation technique from the following data. [8]

| x | 3 | 5 | 7 | 9 | 11 |
|---|---|---|---|---|---|
| y | 8 | 10 | 9 | 12 | 5 |

7. Fit the curve $y = ax^b$ to the following data: [8]

| | | | | | |
|---|---|---|---|---|---|
| 4 | 5 | 7 | 10 | 11 | 13 |
| 48 | 100 | 294 | 900 | 1210 | 2028 |

8. Evaluate $\int_0^{\pi/2} e^{\sin x} dx$ using Gaussian 3-point formula. [6]
9. Find $f'(3)$ from the following table: [5]

| x: | 2 | 4 | 8 | 12 | 16 |
|---|---|---|---|---|---|
| f(x): | 20 | 23 | 30 | 35 | 40 |

10. Solve $y' = \frac{y}{x^2 + y^2}$, $y(0) = 1$ using R - K2 method in the range 0, 0.5, 1. [6]
11. Solve the BVP: $y'' + 3y' = y + x^2$, $y(0) = 2$, $y(2) = 5$ at $x = 0.5, 1, 1.5$ using finite difference method. [5]
12. Solve the elliptic equation $\nabla^2 u = 0$ in the square plate of size 8cm × 8cm if the boundary values are given 50 on one side of the plate and 30 on its opposite side. On the other sides the values are given 10. Assume the square grids of size 2cm × 2cm. [10]

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