14 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2072 Magh

Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B. Agri, BGE	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.*

[Q:18]

1. Discuss the necessity of numerical methods in the field of Science and Engineering in this modern age of computers. [4]
2. Find a real root of the equation $x\tan u - 1 = 0$ using bisection method correct up to three (3) significant digits. [6]
3. Write Psudocode for solving a Non-Linear equation using the secant method. [6]
4. Find the inverse of the matrix $A = \begin{bmatrix} 2 & -2 & 4 \\ 2 & 3 & 2 \\ -1 & 1 & 1 \end{bmatrix}$ using Gauss Jordan method. [8]
5. Find the largest eigen value and the corresponding eigen vector of the following matrix. [8]

$$\begin{bmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{bmatrix}$$

6. Using the least square method, determine the exponential fit of the form $y = ae^{bx}$ for the following data:

x	0	1	2	3	4	5
y	1.5	2.5	3.5	5.0	7.5	11.25

7. Compute y(6) from the following data using Cubic Spline Interpolation. [8]

x	1	3	5	7	9
y	3	5	4	2	3

8. Derive an expression for evaluating first and second derivatives using Newton forward difference interpolation formula. [4]
9. Evaluate $\int_0^3 (\sin x + \cos x + 2)dx$ using Simpson's -3/8 rule taking h = 0.5. Determine the percentage error by comparing the result with exact solution. [4+2]
10. Using Finite difference method solve the BVP: $y'' = 4y' - 4y + e^{2x}, y(0) = 0, y(1) = 2$ for three internal points in (0,1). [8]
11. Write algorithm for solving an initial value problem of first order using RK-4 method. [4]
12. Solve the equation $\nabla^2 u = -10(x^2 + xy + 10)$ over the square with sides $x = y = 0$, $x = y = 3$ with $u = 10$ on the boundary and mesh length 1. [10]

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