13 TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2071 Bhadra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BGE, B.Agri.	Pass Marks	32
Year / Part	II / II	Time	3 hrs.

Subject: - Numerical Methods *(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. Create difference table from following data. [4]

X	3.0	3.2	3.4	3.6	3.8
Y	0.4771	0.5051	0.5315	0.5563	0.5798

2. Use bisection method to find a real positive root of $\sin x = \frac{1}{x}$ correct upto three decimal places. [8]

3. Write a pseudo-code to find a real root of a non-linear equation using Secant Method. [4]

4. Solve the following linear equations using Gauss Elimination or Gauss Jordan method using partial pivoting. [8]

$$
\begin{aligned}
2x + 3y + 2z &= 2\\
10x + 3y + 4z &= 16\\
3x + 6y + z &= 6
\end{aligned}
$$

5. Find the largest eigen-value and the corresponding eigen-vector of the following matrix. [8]

$$
\begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}
$$

6. Find the best fit curve in the form of $y = a + bx + cx^2$ using least square approximation from the following discrete data. [8]

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	1.1	1.3	1.6	2.0	2.7	3.4	4.1

7. Use Lagrange's Interpolation formula to find the value of y when x = 3.0, from the following table. [8]

x	3.2	2.7	1.0	4.8	5.6
y	22.0	17.8	14.2	38.3	51.7

8. Evaluate $\int_0^2 f(x)dx$, for the function $f(x) = e^x + \sin 2x$ using composite Simpson's 3/8 formula taking step size $h = 0.4$. [5]

9. Evaluate $\int_0^2 \frac{dx}{x^2 + 2x + 1}$ using Gaussian 3 point formula. [5]

10. Solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ using RK – 4 method, for y(0.4). (Given, y(0) = 1, h = 0.2) [6]

11. Using the finite difference method, find y(0.25), y(0.5) and y(0.75) satisfying the differential equation $xy'' + y = 0$, subject to the boundary conditions y(0) = 1, y(1) = 2. [6]

12. Solve the Poisson equation $u_{xx} + u_{yy} = -81xy$, $0 < x < 1$, $0 < y < 1$ given that $u(0, y) = 0$, $u(x, 0) = 0$, $u(1, y) = 100$, $u(x, 1) = 100$ and $h = 1/3$. [10]