13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2073 Bhadra

Exam.	Regular		
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.*

[7×18]

1. Discuss the difference between absolute error and relative error with appropriate examples. [4]
2. Write an algorithm of Secant method for finding a real root of a non linear equation. [4]
3. Find a real root of the equation $\sin x = e^{-x}$ correct up to four decimal places using N-R method. What are the limitations of this method? [8]
4. Apply Gauss Seidal Iterative Method to solve the linear equations correct to 2 decimal places. [8]

$$10x + y - z = 11.19$$
$$x + 10y + z = 28.08$$
$$-x + y + 10z = 35.61$$

$\frac{123}{100} = 1.23$, $\frac{117}{50} = 2.34$, $\frac{69}{20} = 3.45$

5. Find the dominant Eigen value and the corresponding Eigen vector of the given matrix using power method. [8]

$$\begin{bmatrix} 15 & -4 & -3 \\ -10 & 12 & -6 \\ -20 & 4 & -2 \end{bmatrix}$$

6. What is the practical significance of the least squares method of curve fitting? Derive the normal equations to fit a given set of data to a linear equation $(y = ax + b)$ [2+6]
7. Using stirling formula find u_{28}, given; [8]

$u_{20} = 49225, u_{25} = 48316, u_{30} = 47236, u_{35} = 45926, u_{40} = 44306$

8. Estimate the value of cost (1.74) from the following data: [4]

x	1.7	1.74	1.78	1.82	1.86
Sin(x)	0.9916	0.9857	0.9781	0.9691	0.9584

9. Evaluate $\int_{0.2}^{1.5} e^{-(x^2)} dx$ using the 3 point Gaussian quadrature formula. [6]
10. Solve the following simultaneous differential equations using Runge-Kutta second order method at x = 0.1 and 0.2. $dy/dx = xz + 1; dz/dx = -xy$ with initial conditions y(0) = 0, z(0)=1 [6]
11. Write a program in any high level language (C/C++/FORTRAN) to solve a first order initial value problem using classical RK-4 Method. [6]
12. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ on the square mesh bounded by $0 \le x \le 3, 0 \le y \le 3$. The boundary values are $u(x,0) = 10, u(x,3) = 90, 0 \le x \le 3$ and $u(0,y) = 70, u(3,y) = 0, 0 < y < 3$. [10]

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