13 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2075 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.*

1. Construct the divided difference table from the following data set: $(x_0,y_0),(x_1,y_1),(x_2,y_2),(x_3,y_3)$ and (x_4,y_4). [4]
2. Write a pseudo-code to find a real root of non-linear equation using Fixed Point Iteration method. [6]
3. Find a real root of the equation $e^{2.80x}+\cos x=3x^2$ correct to 3 decimals using bracketing method. [6]
4. Solve the following system of equations using Gauss-seidel method. Correct to four decimal places. [8]

$$x_1+x_2+3x_3+2x_4=12$$
$$2x_1+x_2+x_3+4x_4=11$$
$$10x_1+2x_2-4x_3+x_4=3$$
$$5x_1+8x_2-3x_3+2x_4=-3$$

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

5. Find the largest Eigen value and the corresponding Eigen vector of the matrix using Power Method. [8]
6. State normal equations for fitting a parabola $y=ax^2+bx+c$ to the given data, [8]

   $(x_i,y_i): i=1,2....n$ and hence use it to fit $y=ax^2+bx+c$ to the following data:

X	1.0	2.0	2.5	3.0	3.5	4.0
Y	1.1	1.3	2.0	2.7	3.4	4.1

7. Develop a pseudocode to interpolate the given sets of data using Lagrange's interpolation. [6]
8. Derive an expression to evaluate first derivative from Newton's backward interpolation formula and evaluate $\frac{dy}{dx}$ at $x=9$ from the following table. [6]

x	1	3	5	7	9
y	-1.20	12.80	119.60	472.80	1302.80

9. Derive the general Newton-cotes quadrature formula and hence use it to obtain simpson's -3/8 formula. [6]

10. Using finite difference method solve the following BVP: [6]

$$y''-3y'+2y=2, y(0)=1, y(1)=4$$

in the interval [0,1]. Take h = 0.25

11. Write a program in any high level language (C/C++/FORTRAN) to solve the second order differential equations using classical RK-4 method. [6]

12. Derive Bende-Schimidt recurrence formula for solving one-dimensional heat equation $u_t = c^2 u_{xx}$ and use it to solve the boundary value problem $u_t = u_{xx}$ under the condition $u(0,t) = u(1,t) = 0$ and $u(x,o) = \sin(\pi x)$ upto t =5 seconds. (Take h = 0.2) [5+5]

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