13 TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division

2073 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.*

1. Discuss the importance of Numerical Methods in Science and Engineering. [4]

2. Find a real root of $\cos x + e^x - 5 = 0$ accurate to 4 decimal places using the Secant Method. [6]

3. Write pseudo-code to find a real root of a non-linear equation using the Bisection Method. [6]

4. Compute the inverse of following matrix using the Gauss-Jordan Method. [8]

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

5. Write algorithm for computing the dominant Eigen value and corresponding vector of a square matrix using the Power method. [8]

6. Fit the following set of data to a curve of the form $y = ab^x$. [8]

x	1.0	1.5	2.0	2.5	3.0	3.5	4.0
y	8.2	5.2	3.1	2.5	1.7	1.6	1.4

7. Estimate $y(4.5)$ from the following data using Natural Cubic Spline Interpolation technique. [8]

x	1	3	5	7	9
y	10	12	11	13	9

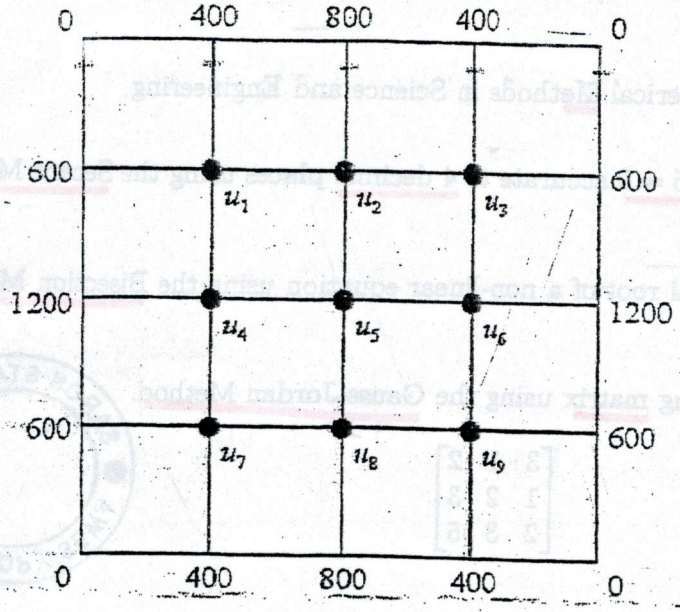
8. Derive the formula to evaluate $y'(x)$ and $y''(x)$ from Newton's Forward Interpolation formula. [4]

9. Evaluate $\int_0^{1.4} (\sin x^3 + \cos x^2)\, dx$ using Gaussian 3-point formula. [6]

10. Solve $y' = \sin x + \cos y$ subject to initial condition $y(0) = 2$ in the range $0(0.5)2$ using the Runge-Kutta second order method. [6]

11. Write a program in C/C++/FORTRAN to solve a second order ordinary differential equation (initial value problem) using the Runge-Kutta fourth order method. [6]

12. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the square mesh with boundary values as shown in the figure below. [10]



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