TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division

2069 Poush

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

(T:B)

1. Write an algorithm to find a real root of a non-linear equation using the bisection method. [4]
2. How can you obtain a real of a noon-linear equation using the Secant method? Explain graphically and hence obtain the iteration formula. [4]
3. Find the root of the equation $xe^x - \cos x = 0$ using the secant method correct to four decimal places. [8]
4. Solve the following system of linear equations using the Gauss Elimination method with partial pivoting. [8]

$$x + 2y - 12z + 8v = 27$$
$$5x + 4y + 7z - 2v = 4$$
$$-3x + 7y + 9z + 5v = 11$$
$$6x - 12y - 8z + 3v = 49$$

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

$$\begin{bmatrix} 1 & 4 & -1 \\ 4 & 2 & 5 \\ -1 & 5 & 10 \end{bmatrix}$$

6. Using Lagrange's interpolation formula evaluate f(27.5) from the table : [6]

x:	26	27	28	29	30
f(x):	3.846	3.704	3.571	3.448	3.333

7. Using the Natural Cubic Spline interpolation technique, estimate the value of y(0.5) from the following data: [10]

x	0	1	2	3
y	2.0	2.2	1.0	0.5

8. The distance y(t) traversed in time t by an object moving in a straight line is given below; approximate the velocity and acceleration at 0.2 seconds. [6]

t(in seconds)	0.0	0.1	0.2	0.3	0.4	0.5	0.6
y(in times)	0.0	1.5	7.1	14.3	24.5	36.7	50.0

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9. Evaluate the integral $I = \int_{0.2}^{1.2} (\log(x+1) + \sin 2x)dx$, using Gaussian 2 point and 3 point formula. [6]

OR

Write a Pseudo-code to integrate a given function within given limits using Simpson's 3/8 rule.

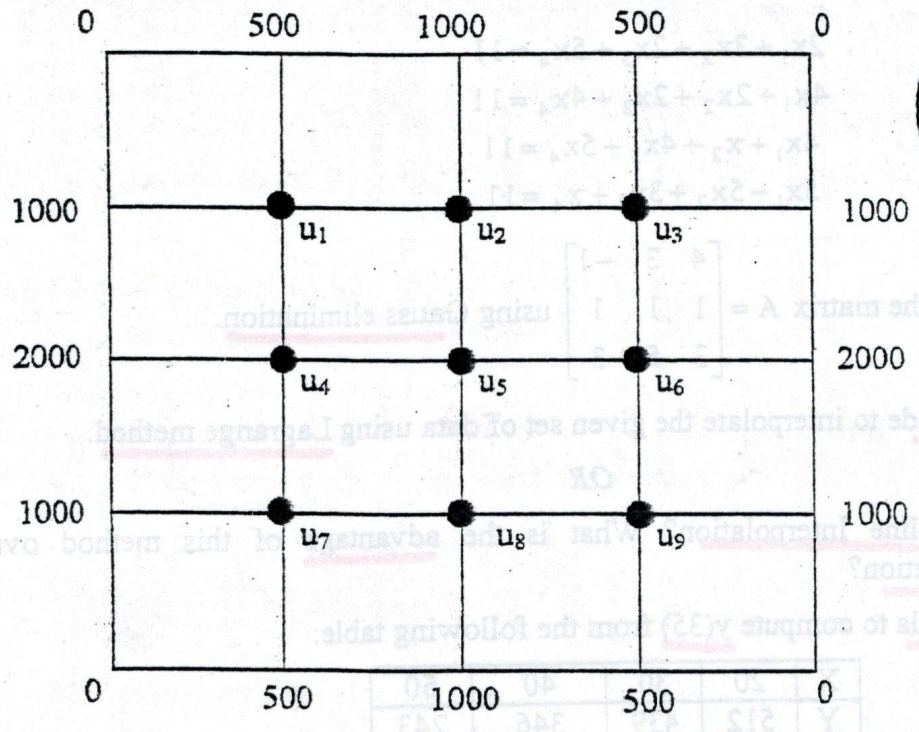
10. Solve the differential equation, $\frac{dy}{dx} = (1+x^2)y$, within $x \le 0(0.2)0.4$ and $y(0) = 1$ using RK 4th order method. [6]

11. Solve the following boundary value problem using the finite difference method, by dividing the interval into four sub-intervals. $\frac{d^2y}{dx^2} = x + y, y(0) = y(1) = 0.$ [6]

12. Solve the equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over a square mesh with sides $x = 0$, $y = 0$, $x = 3$, $y = 3$ with $u = 0$ on the boundary and mesh length = 1. [10]

OR

Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with the boundary values as shown.



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