TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2075 Chaitra

Exam.	Regular / Back		
Level	BE	Full Marks	80
Programme	BCE, BME, BAM, BIE	Pass Marks	32
Year / Part	III / I	Time	3 hrs.

Subject: - Numerical Methods *(SH 603)*

- ✓ 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 advantages and limitations in solving mathematical problems by numerical techniques rather than analytically. [4]

2. Find a negative real root of the following equation correctto three decimals using Bisection Mehod. [6]

$$\frac{1-(x+1)^4}{x}-1=0$$

3. What are limitations of Newton-Raphson method? Using Newton-Raphson method, find a root of the equation xsinx – cosx = 0 correct to four decimal places. [2+4]

4. Solve the following system of linear equation, using Gauss-Elimination method with partial pivoting technique. [8]
$x_1-3x_2+8x_3=3$
$5x_1+x_2+2x_3=9$
$x_1+7x_2-x_3=14$

5. Obtain the dominant eigen value and its corresponding eigen vector of the following matrix using Power method. [8]

$$\begin{bmatrix} 1 & 4 & 4 \\ 4 & 1 & 8 \\ 4 & 8 & 1 \end{bmatrix}$$

6. Using the Method of Least Squares, fit the following set of data to a curve of the form $y = a \log_e x + b$. [8]

x	0.5	1.0	1.5	2	2.5	3
y	3.7	5.3	5.8	6.6	6.9	7.5

7. Using the cubic spline technique, estimate f(4) from the following data: [8]

x	1	3	5	7	9
f(x)	1.5	-0.4	-6.9	6.1	6.4

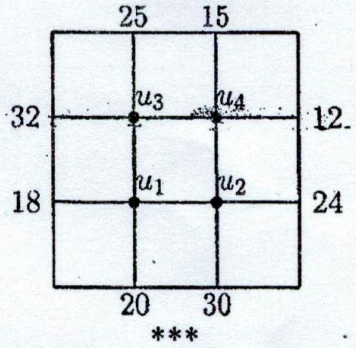
8. Derive composite Simpson's 3/8 formula for integration. [4]

9. Use Romberg's method to compute $\int_0^1 \frac{1}{1+x^2}dx$ correct to three decimal places. [6]

10. Using Euler's method, solve $\frac{dy}{dx}=\frac{y+x}{y-x}$, with y=1 at x=0, for x=0.1, h=0.02. [6]

11. Solve the following boundary value problem using Finite Difference Method taking a step-size of 0.5. $y''+2y'+y=3x^2$ subject to boundary conditions $y(0) = 5$ and $y(2)=4$. [8]

12. Solve the Laplace equation $u_{xx}+ u_{yy}=0$ for the square mesh with boundary conditions as shown in the figure attached. [8]



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