24 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2068 Magh

Exam.			
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, B.Agri.	Pass Marks	32
Year / Part	II / II	Time	3 hrs.

Subject: - Numerical Method

- ✓ 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:18]

1. Evaluate the real root of $f(x) = 4 \sin x - e^x$, using Newton Raphson method. The absolute error of root in consecutive iteration should be less than 0.01%. [8]
2. Write an algorithm to find a real root of a non-linear equation using the Newton-Raphson method. [4]
3. Round off the numbers 865250 and 37.46235 to four significant figures and compute relative, absolute and percentage errors. [4]
4. Solve the following system of linear algebraic equations using the Gauss Elimination Method. [8]

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

5. Find the inverse of the matrix $A = \begin{bmatrix} 4 & 3 & -1 \\ 1 & 1 & 1 \\ 3 & 5 & 3 \end{bmatrix}$ using Gauss elimination. [8]
6. Develop a Pseudocode to interpolate the given set of data using Lagrange method. [8]

OR

What is Cubic Spline Interpolation? What is the advantage of this method over polynomial interpolation?

7. Use Stirling's formula to compute y(35) from the following table: [8]

X	20	30	40	50
Y	512	439	346	243

OR

Fit the following set of data into a curve $y = \frac{ax}{b+x}$

X	1	2	3	4	5
Y	0.500	0.667	0.750	0.2	0.833

8. A rod is rotating in a plain. The following table gives the angle in radians (θ) through which the rod has turned for various values of time in seconds (t). Find the angular velocity and angular acceleration t = 0.2. [4]

t	0	0.2	0.4	0.6	0.8
θ	0	0.122	0.493	0.123	2.022

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9. Evaluate the following using Gaussian three point formula: $\int_0^2 e^{-x/3} dx$. [4]

10. Solve the ordinary differential equation, $y'' = xy'^2 - y^2$ for $x = 0.6$ with initial conditions $y(0) = 1$, $y'(0) = 0$ by using R-K second order method. (Take $h = 0.3$) [6]

11. Write Psedocode to solve an initial value problem (first order differential equation) using the Runge-Kutta fourth order method. [6]

12. Solve the Possion equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 2x^2y^2$ over the square domain $0 \le y \le 3$ with $h = k = 1$ and boundary conditions are $u(0,0) = 0$, $u(3,0) = 0$, $u(0,3) = 0$ and $u(3, 3) = 0$. [10]

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