TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

Examination Control Division
2076 Baishakh

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 Method (SH 603)

- ✓ Candidates are required to give their answer in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicates **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What do you mean by significant digits? Find the absolute, relative and percentage errors if the number x = 4.320106 is truncated to four significant digits.
2. Define a root of a non-linear equation f(x) =0. Give its geometrical meaning. Derive the formula of secant method.
3. Find a real root of the equation log(x)-cos(x) =0 using bisection method correct up to three decimal places.
4. Solve the following system of linear equations using Gauss Elimination with partial pivot technique.

$2x_1 + 5x_2 + x_3 + 5x_4 = 45$

$-8x_1 + 3x_2 + 5x_3 - 6x_4 = -10$

$4x_1 - 3x_2 + x_3 + 5x_4 = 26$

$2x_1 - 7x_2 - 2x_3 + 8x_4 = 6$

Or,

Write the program code in c/c++ to find the inverse of the given square matrix using Gauss Jordan Method.

5. Obtain the dominant Eigen value and its corresponding Eigen vector of following matrix using Power Method.

$$\begin{bmatrix} 1 & 2 & 4 \\ 2 & 2 & 3 \\ 4 & 3 & 2 \end{bmatrix}$$

6. From the following table, evaluate y (2.4) and y (5.2) using appropriate interpolation formula.

X	2	3	4	5	6	7	8
Y	-0.62	2.72	22.00	81.83	223.38	508.52	1023.93

7. State normal equations for fitting a straight line y=ax+b to the given data (xi,yi), i=1,2,3,…n and hence use it to fit the curve $y=ab^x$ to the following data:

X:	20	25	30	35	40	45
Y:	354	332	391	260	231	204

8. A slider in a machine moves along a fixed straight rod. Its distance 'x' along the rod is given below for various values of time 't' seconds. Find the velocity of the slider and its acceleration when t=0.1 and t=0.6 sec.

T	0	0.1	0.2	0.3	0.4	0.5	0.6
X	30.13	31.62	32.87	33.64	33.95	33.81	33.24

9. Evaluate $\int_{0.2}^{1.5} \frac{e^{-x^2}}{1+x^2} dx$ using the 3 point Gaussian quadrature formula.
10. Given that: $y' = 2\cos x - e^x + 3$, find an appropriate value of y (0, 4) with an initial y (0) =1 using fourth order Runge-Kutta method, with a step size of 0.2.
11. Solve the following boundary value problem using shooting method by dividing the interval into our sub-intervals using Euler's formula.

    $Y'' = 4e^x \sin x + 3y - xy'$, with y(0) =1 and y(1) =5

12. Solve the equation $u_{xx} + u_{yy} = 0$ over the square mesh of sides 3 units satisfying the following boundary conditions u(x,0) =0, $u(x,3)=10+3x^2$, $0 \le x \le 3$, $u(0,y) = y^3$ $0 \le x \le 3$ for $0 \le y \le 3$ $u(3,y) = \frac{1}{2} y^4$, find the value of u(i,j), i=1,2; j=1,2.