NEPAL COLLEGE OF INFORMATION TECHNOLOGY

Level: Bachelor Semester – spring Year : 2021
Programme: BE Full Marks: 100
Course: Numerical Methods Time : 3hrs.

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Attempt all the questions.

1. a) Write down the algorithm of finding root using regula –falsi method. Estimate the real root of x+ ln(x) =3 using secant method correct up to 3 decimal place. **8**

   b) Show that the convergence of N-R method have quadratic convergence and Solve for a positive root of the equation $x^4 - x -10 = 0$ using Newton – Raphson method. **7**

2. a) Fit cubic polynomial equations to the given data set and find the value of f (1.7) and f' (4.5). **8**

X	1	2	3	4	5
f(X)	1	0	1	0	1

   b) Given the following table, find the number of students whose weight is between 60 and 70 lbs: **7**

Weight in (lb.)	0-40	40-60	60-80	80-100	100-120
No. Of student	250	120	100	70	50

3. a) Integrate the given integral **7**

$$\int_{1}^{2} \frac{1}{1+e^{3x}} \, dx$$

   Using Romberg Integration Formula

   b) Find the first two derivatives of $(x)^{1/3}$ at x=50 and x=56 for the given table: **8**

X	50	51	52	53	54	55	56
y=$(x)^{1/3}$	3.864	3.7084	3.7325	3.756	3.7798	3.803	3.8359

4. Solve, by Relaxation method, the following system: **8**

$$28x_1 + 4x_2 - x_3 = 32$$
$$x_1 + 3x_2 + 10x_3 = 24$$
$$2x_1 + 17x_2 + 4x_3 = 35$$

   a) Find the largest Eigen-value and the corresponding Eigen-vector of the following square matrix using Power method. **7**

$$\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$$

5. a)   Given $y'' + x y' + y = 0$, y (0) = 1, y' (0) = 0 . Find the value   7
of y(0.1) by using Runge-Kutta method of fourth order .

b) Consider second order initial value problem $y''-4 y'+2y= e^t$ sin   8
(t) with y(0) = 0.4 and y'(0) = - 0.6, using Heun's find value of
y(0.2) and y'(0.2).

6.
   a) Using Runge – Kutta method of fourth order, determine the   8
   value of y (0.2). if $y'' + xy' + y = 0, y(0) = 1$ and $y'(0) = 0$
   $y'' + xy' + y = 0, y(0) = 1$ and $y'(0) = 0$

   b) Consider and equation Uxx + Uyy=4(x2-6xy+y2) is applied   7
   over a square grid satisfying the condition   having U=20 on
   boundary. Assuming the value of mesh length h=k=1 determine
   the value of U at the internal mesh point.

7. **Write short notes on**   5×2
   a) Write sufficient condition for convergence of an iterative
   method for *f (x) = 0;* written as *x = g(x).*
   b) Write down the procedure to find the numerically smallest
   Eigen value of a matrix by power method.
   c) Write down the standard five point formula to find the
   numerical solution of Laplace equation.
   d) State Lagrange's interpolation formula for unequal intervals.
   e) Write the diagonal five point formula to find the numerical
   solution of Laplace equation.