POKHARA UNIVERSITY

Level: Bachelor | Semester: Spring | Year : 2024
Programme: BE | Full Marks : 100
Course: Numerical Methods (New) | Pass Marks : 45
Time : 3 hrs.

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) Solve $x \log_{10} x = 1.2$ by Newton- Raphson method correct to four decimal places. 8

   b) Using Secant Method, find the roots of function $2x - \log_{10} x - 7 = 0$ Correct up to three decimal places. 7

   OR

   Find the root of the equation $f(x) = x^2-4x-10$ correct to three decimal places by using False Position method.

2. a) From the following data given in the table below evaluate f (2.5) by using Lagrange method. 8

x	1	2	4	5	7
f(x)	1	1.414	1.732	2.00	2.6

   b) From the following table, Estimate the number of student who obtained marks between 50 and 55. 7

Marks	30-40	40-50	50-60	60-70	70-80
No of Students	31	42	51	35	31

3. a) Compute the Simpson's 1/3 and Simpson's 3/8 rule for $I = \int_0^1 e^{-x^2} dx$ using a regular partition with subinterval n=6. 8

   b) Use the Romberg integration to find the solution correct upto three decimal places. 7

$$I = \int_0^1 \frac{1}{1+x^2}$$

4. 8

a) Solve : $3x+2y+z=10$
$2x+3y+2z=14$
$x+2y+3z=14$

By Gauss elimination method.

b) Solve the following system of equations using Crout method. 7

$x+y+z=4, x+4y+3z=8, x+6y+2z=6$

OR

Find largest eigen value and corresponding eigen vector of the matrix.

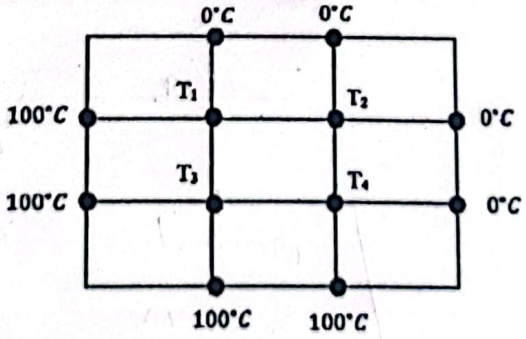
$$\begin{bmatrix} 3 & -1 & 0 \\ -2 & 4 & -3 \\ 0 & -1 & 1 \end{bmatrix}$$

5. a) Solve the following differential equation within $0 \le x \le 0.3$ using RK-4TH order Method. 8

$$10\frac{dy}{dx} = x^2 + y^2, y(0) = 1 \text{ with } h = 0.1$$

b) Apply Euler's method to approximate value of $y(0.3)$ for the differential equation: $\frac{dy}{dx} = y + x, y(0) = 1$. 7

6. a) For square bar of size 15cm×15cm, calculate the steady state temperature at interior point for the grid size of 5cm×5cm. 8



b) Solve the Poisson equation $\nabla^2 f = 2x^2 + y$, over the square domain $1 \le x \le 4$, $1 \le y \le 4$, with $f=0$ on the boundary. Take step size in x and y, $h=k=1$. 7

7. Write short notes on: **(Any two)** 2×5

a) Errors in Numerical Method

b) Ill-conditioned systems

c) Boundary value problem