

POKHARA UNIVERSITY

Level: Bachelor

Semester: Fall

Year : 2022

Programme: BE

Full Marks: 100

Course: Numerical Methods

Pass Marks: 45

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) Find the root of the equation $f(x) = x^2 - 4x - 10$ correct to three decimal places by using False Position method. 7

- b) Estimate the root of the equation $f(x) = xe^x - \cos x$ using Newton Raphson method correct to three decimal places. 8

2. a) From the following table estimate the number of student who obtained marks between 40 and 45. 7

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

- b) 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

3. a) Evaluate $\int_1^5 \frac{1}{x} dx$ by using Gaussian Integration formula for $n=3$ and compare the value with exact solution. 7

- b) Use the Romberg integration to find the solution correct upto three decimal places. 8

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

4. a) Find the solution of the given simultaneous linear equation using Gauss Seidel method. 7

$$6x_1 - 2x_2 + x_3 = 11$$

$$-2x_1 + 7x_2 + 2x_3 = 5$$

$$x_1 + 2x_2 - 5x_3 = -1$$

- b) Solve the following system of equations using Crout method. 8

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

5. a) Using the Euler's (R-K Ist order method) find an approximate value of y corresponding to $x=1$, given that $dy/dx = X+Y$ and $y=1$. When $x=0, h=0.1$. 8

- b) Apply Euler's method to approximate value of $y(0.3)$ for the differential equation: 7

$$\frac{dy}{dx} = y + x, y(0) = 1.$$

6. a) Torsion on a square bar of size $15\text{cm} \times 15\text{cm}$. If two of the sides are held at 100°C and the other two sides are held at 0°C . Calculate the steady state temperature at interior points. Assume a grid size of $5\text{cm} \times 5\text{cm}$. 8

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

7. Write short notes on: (Any two) 2x5

- a) Ill-conditioned and Well-conditioned systems

- b) Error in Numerical method

- c) Cubic Spline.