POKHARA UNIVERSITY

Level: Bachelor | Semester: Fall | Year : 2023
Programme: BE | Full Marks: 100
Course: Numerical Methods (New) | 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) Evaluate a real root of the given equation: $f(x) = 3x + \sin x - 2$ using Fixed point iterative method correct to four decimal places. 7

OR

Define error. Explain its type with sources of error in Numerical computation.

b) Calculate the root of the equation: $4x^3 - 2x - 6 = 0$ correct upto three decimal places using Bisection Method. 8

2. a) What is interpolation? Find the value of $f(1.2)$ using appropriate interpolation technique. 8

x	1	1.4	1.8	2.2
$f(x)$	50	70	100	120

b) If P is pull required to lift a load W by means of a Pulley, Find the law of form 7
$P = mW + C$, (where m *and* C are constants) using least square method for the following data:

P	12	15	21	25
W	50	70	100	120

OR

Use the suitable method to fit a curve $y = ax^b$ for the following data

x	-2	-1	0	1	2	3	4
y	38	6	0	-5	-41	130	300

3. a) Compute the following using Simpson's 1/3 rule for n= 8 with an accuracy to five decimal places.

$$\int_1^5 e^{-x^2}\,dx$$

b) Evaluate the following using Gaussian three point Integration formula: 8

$$\int_2^4 (x^4 + 1)\, dx$$

4. a) Solve the following system of Linear equations using partial pivoting method. 7

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

b) Solve the following system of equations using Gauss Jacobi's method. 8

$$3x + 2y + z = 10, 2x + 3y + 2z = 14, x + 2y + 3z = 14$$

5. a) Find the largest Eigen value and Corresponding Eigen vector of given matrix using power method. 7

$$A = \begin{bmatrix} 2 & 5 & 1 \\ 5 & -2 & 3 \\ 1 & 3 & 10 \end{bmatrix}$$

b) Solve the following differential equation for $y(0.4)$ using Heun's method. 8

$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - 3y = 6x$; with $y(0) = 0$ and $y'(0) = 1$ (take h=0.2).

6. a) Use Euler's method to solve the following equation for $y(1)$ using $h = 0.25$. 7

$$\frac{dy}{dx} = x + y + xy \quad ; \quad y(0)=1$$

b) Solve the Poisson equation $\nabla^2 f = -10(x^2 + y^2 + 10)$ over the square with $0 \le x \le 3$; $0 \le y \le 3$ and $f = 0$ on boundary. Use $h = 1$. 8

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

a) Initial Value problems and Boundary value problems

b) Algorithm for secant method

c) Schmidt method for one dimensional heat equation