POKHARA UNIVERSITY

Level: Bachelor | Semester: Fall | Year : 2018
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) Derive an iterative formula for NR-method Find a positive real root of the equation $x \times \log_{10}(x) = 1.2$ by using this formula correct to four significant digits. 7

   b) Using Secant method find a root of the equation $e^x \, Sin\, x - x^2 = 0$ correct to three decimal places. 8

2. a) Generate a Lagrange's interpolating polynomial for the function: $y = \cos \pi x$, taking the pivotal points 0, ¼ and ½. 8

   b) Fit a curve of the form: $y=1/(a+bx)$ by using the method of Least Square with the following data points. 7

x	1	2	3	4	5
f(x)	3.33	2.20	1.52	1.00	.91

3. a) Evaluate the integral $I = \int_0^{\frac{\pi}{2}} (1 + 3\cos 2x)dx$. Compare the result in both conditions for Simpson1/3 and 3/8 rule. 10

   b) The following data gives corresponding values of pressure 'P' and specific volume 'V' of stem. 5

P	105	42.7	25.3	16.7	13
V	2	4	6	8	10

Find the rate of change of volume when pressure is 105 and 13.

4. a) Find the inverse of matrix using gauss Jordan method.

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

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

$$\begin{bmatrix} 15 & -4 & -3 \\ -10 & 12 & -6 \\ -20 & 4 & -2 \end{bmatrix}$$

5. a) Solve the given differential equation by RK-4th order method $y'' - x^2 y' - 2xy = 0$ with initial condition $y(0) = 1, y'(0) = 0$, for $y(0.1)$ taking $h = 0.1$ 8

   b) Solve the differential equation $y' = y - \frac{2x}{y}$ using appropriate method within $0 \le x \le 0.2$ with initial condition $y(0) = 1$ and step size $h=0.1$ 7

6. a) Solve the equation $\nabla^2 u = -10(x^2 + y^2 + 10)$ over the square mesh $0 \le x \le 3, \quad 0 \le y \le 3$ with $u = 0$ on the boundary and mesh length $h = k = 1$ 8

   b) Solve the following system of equation 7

$$6x_1 - 2x_2 + x_3 = 4$$
$$-2x_1 + 7x_2 + 2x_3 = 5$$
$$x_1 + 2x_2 - 5x_3 = -1$$

   Using gauss factorization method.

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

   a) Importance of Numerical Methods in Engineering
   b) Algorithm for Lagrange's Interpolation method
   c) Laplace method for partial Differential