POKHARA UNIVERSITY

Level: Bachelor | Semester: Fall | Year : 2017
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 a positive root of the equation $x\sin x - 1 = 0$ using any closed end method up to four decimal place. 8

   b) Solve $f(x) = 3x + \text{six} - e^x$ by secant method. 7

2. a) Find the number of students securing marks between 50-55 using appropriate interpolation technique. 8

Mark Obtained	20-30	30-40	40-50	50-60
No. of students	10	20	30	40

   b) The voltage v across a capacitor at time t seconds is given by following table. 7

Time t(sec)	0	2	4	6	8	4
voltage v	150	63	28	12	5.6	124

   If the relationship between voltage v and time t is of the form $v = e^{kt}$. Using least-square approximation estimate the temperature at t=2.6 minute.

3. a) Estimate the following Integrals by 8

   i. Simpson's 3/8 method

   ii. Simpson's 1/3 method and compare the result.

$$\int_2^1 \frac{e^x . dx}{x}$$ (Assume n =4)

   b) Apply Romberg's method to evaluate 7

$$\int_0^{\frac{\pi}{2}} \frac{\cos x}{\sqrt{1+\sin x}} . dx$$

4. a) Solve the system $3x_1+2x_2+x_3=10$ 8

   $2x_1+3x_2+2x_3=14$

   $X_1+2x_2+3x_3=14$

   By using Do-Little method.

   b) Find the inverse of the matrix by using Gauss Jorden method. 7

$$A=\begin{pmatrix} 1 & -1 & 2 \\ 3 & 0 & 1 \\ 1 & 0 & 2 \end{pmatrix}$$

5. a) Determine the largest eigenvalue and the corresponding eigenvector of the matrix: $A=\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ using the power method. 8

   b) Solve the differential equation $y' = y + \sin x$ using appropriate method within $0 \le x \le 0.2$ with initial condition y(0) = 2 and step size h=0.1. 7

6. a) Apply R-K-4 method to solve y(0.2) for the given equation $\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y$ given that y=1 and $\frac{dy}{dx} = 0$ when x=0. (Assume h=0.2.) 8

   b) Solve the parabolic equation $2f_{xx}(x,t) = f_t(x,t)$ $0 \le t \le 1.5$ and given initial condition $f(x,0) = 50(4-x), 0 \le x \le 4$ with boundary condition $f(0,t) = 0 = f(4,t)\ 0 \le t \le 1.5$ 7

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

   a) Gauss Seidel Method of Iteration

   b) Cubic Spline

   c) Laplace method for partial Differential