POKHARA UNIVERSITY

Level: Bachelor Semester: Spring Year : 2019
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) Using **Secant** method, find the zero of function $f(x) = 2x - \log_{10} x - 7$ correct up to three decimal places. 8

   b) Find the root of the equation logx – cosx = 0 correct to three decimal placed by using N-R method. 7

2. a) The voltage v across a capacitor at time t seconds is given in following table. 8

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 $v = ae^{kt}$. Using least-square approximation estimate the temperature at t=2.6 minute.

   b) From the following table, estimate the number of students who obtained marks between 40 and 45. 7

Marks:	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

3. a) The following table gives the velocity of a vehicle at various points of time. 7

Time, t(seconds)	1	2	4	5
Velocity, v(m/sec)	0.25	1	2.2	4

   Find the acceleration of the vehicle at t = 1.1 second and t = 2.5 second using any suitable differential formula.

   b) Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin u}{u}\, du$ by using Trapezoidal , Simpson's 1/3 and 3/8 rule with n=6 8

4. a) Determine the largest Eigen value and corresponding Eigenvector for the matrix using power method correct up-to 3-decimal places. 7

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

   b) Obtain the solution of the following system using the Dolittle LU decomposition method. 8

$$3x_1 + 2x_2 + x_3 = 10$$
$$2x_1 + 3x_2 + 2x_3 = 14$$
$$x_1 + 2x_2 + 3x_3 = 14$$

5. a) Solve the given differential equation by Heun's method $y'' - y' - 2y = 3e^{2x}$ with initial condition $y(0) = 0, y'(0) = -2$, for y(0.2) taking h = 0.1 8

   b) Solve: $y' = y + e^x$, $y(0) = 0$ for y(0.2) and y(0.4) by RK-4th order method. 7

6. a) Solve the poison's equation $U_{xx} + U_{yy} = 243(x^2 + y^2)$ over a square domain $0 \le x \le 1, 0 \le y \le 1$ with step size $h = \frac{1}{3}$ with $u = 100$ on the boundary. 8

   b) Use Gauss-Legendre 2-point and 3-point formula to evaluate 7

$$\int_{0.5}^{1.5} e^{x^2}\, dx$$

7. Write short notes on: (**Any two**) 2×5
   a) Ill conditioned Method
   b) Algorithm of bisection method
   c) Cubic splines