POKHARA UNIVERSITY

Level: Bachelor | Semester: Spring | 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) Discuss the application of Numerical methods in the field of science and engineering. Find a real root of $e^{\cos x}-\sin x-1=0$ correct to 4 decimal places using False position method. 8

   b) Find the root of the equation $3x=\cos(x)+1$ using NR method with the tolerance is 10E-5. 7

2. a) The Growth of bacteria (N) in a culture after t hours is given by the following table. 8

Time t(hr.)	0	1	2	3	4	4
Bacteria(N)	32	47	65	92	132	124

If the relationship between bacteria N and time t is of the form $N = ab^t$. Using least-square approximation estimate the N at t=5 hr.

   b) The following table give the percentage of criminals for different age groups. Using interpolation formula, find the percentage of criminals under the age of 35. 7

Under age	25	30	40	50
% of Criminals	52	67.3	84.1	94.4

3. a) A slider in a machine moves along a fixed straight rod. Its distance x (cm) along the rod is given below for various values of time t seconds. Find the velocity and the acceleration of the slider when t=0.2. 8

t	0	0.1	0.2	0.3
x	30.13	31.62	32.87	33.95

   b) The velocity 'v' of a particle at a distance 's' from a point on its path is given by the following table. 7

s(metre)	0	10	20	30	40	50	60
v(metre/sec)	47	58	64	65	61	52	38

Estimate the time taken to travel 60 metres by using Simpson's 1/3 rule and Simpson's 3/8 rule.

4. a) Solve the following set of equation using LU factorization method 8

$5x-2y+z=4$
$7x+y-5z=8$
$3x+7y+4z=10$ 7

   b) Solve the equation by Gauss-Jacobi method:
$20x + y - 2z = 17,\ 3x + 20y - z = -18,\ 2x - 3y + 20z = 25$

5. a) Determine the largest eigenvalue and the corresponding eigenvector of the matrix: $A=\begin{bmatrix} 15 & -4 & -3 \\ -10 & 12 & -6 \\ -20 & 4 & -2 \end{bmatrix}$ using the power method. 8

   b) Use RK-4 Method to find y(0.2) for $\frac{d^2y}{dx^2} = x\frac{dy}{dx} - y$ given that y=1 and $\frac{dy}{dx} = 0$ when x=0. 7

6. a) Given the Poisson's equation: $\nabla^2 u = -10(x^2+y^2+z^2)$ over the square domain such that $0 \le x \le 3$ and $0 \le y \le 3$ with Dirichlet boundary condition of u(x,y)= 0.Calculate the steady state temperatures at interior points by using Successive over relaxation method upto 5th iteration. Assume, h=k=1. 8

   b) Write a program in any higher level language for solution of ordinary differential equation using Euler's method. 7

7. Write short notes on: **(Any two)** 2×5
   a) Boundary Value problem
   b) Parabolic equation
   c) Elliptical equations