POKHARA UNIVERSITY

Level: Bachelor Semester: Spring 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) Find the root of $e^x \tan x = 1$ by creating iterative formula of Newton – Raphson method. 7
   b) Solve $f(x) = xe^x - 1$ by secant method for tolerance value 0.0001. 8
2. a) Determine the constants a and b by the method of least squares such that $y = ae^{bx}$ 7

X	2	4	6	8	10
Y	4.077	11.084	30.128	81.897	222.62

   b) From the following table, find the number of students who obtained less than 45 marks 8

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

3. a) From the following table of values of x and y, obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for x = 1.2 8

x	1.0	1.2	1.4	1.6	1.8
y	2.7183	3.3201	4.0552	4.9530	6.0496

   b) Find the Integral value $I = \int_0^1 \frac{dx}{1+x^2}$ correct to three decimal place using Romberg Integration. 7
4. a) Solve the following system of equations using Factorization method 7
   $2x + 3y + z = 9$
   $x + 2y + 3z = 6$
   $3x + y + 2z = 8$
   b) Determine the highest Eigen value and its corresponding eigenvector for the following matrix using power method. $A = \begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix}$ 8
5. a) Use the Runge - Kutta 4th order method to solve $10\frac{dy}{dx} = x^2 + y^2$, $y(0) = 1$ for the interval $0 \le x \le 0.4$ with $h = 0.1$ 8
   b) Solve the boundary value problem $y''(x) = y(x)$, $y(0) = 0$ and $y(1) = 1.1752$ by shooting method, taking $m_0 = 0.8$ and $m_1 = 0.9$ 7
6. a) Solve the Poisson equation $\nabla^2 f = 2x^2y^2$ over the square domain $0 \le x \le 3$ and $0 \le y \le 3$ with $f = 0$ on the boundary and $h = 1$. 8
   b) Write a program to solve a system of linear equations by Gauss seidal method. 7
7. Write short notes on: **(Any two)** 2×5
   a) Convergence of fixed point iteration method
   b) Cubic spline
   c) Algorithm of Euler Methods.