Registration No : | | | | | | | | | | |

Total Number of Pages : 02 **B.Tech**
PEI5H001

5th Semester Regular / Back Examination 2019-20
NUMERICAL METHODS
BRANCH : AEIE, EIE, IEE
Max Marks : 100
Time : 3 Hours
Q.CODE : HRB293

Answer Question No.1 (Part-1) which is compulsory, any EIGHT from Part-II and any TWO from Part-III.
The figures in the right hand margin indicate marks.

Part- I

Q1 **Only Short Answer Type Questions (Answer All-10)** **(2 x 10)**

a) Define Gauss-Jacobi Iteration method.
b) Round off the number 4.5126 to 3 significant figures and determine the relative percentage error.
c) Calculate divided difference table for the given tabulated values

x	0.0	1.2	2.4	3.7
$f(x)$	3.41	2.68	1.37	-1.18

d) Write the sufficient conditions for convergence of Gauss-Jacobi Iteration method.
e) Determine the iterative formula for evaluating $\sqrt{a}$ by using Newton-Raphson method.
f) Determine $y(0.02)$ for given $\frac{dy}{dx} = x^2 + y$, with $y(0) = 1$.
g) Write formula for Predictor-Corrector method.
h) Define weight function in numerical integration.
i) State Eigen value problem.
j) Define natural spine function.

Part- II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Determine a real root of the equation $f(x) = e^x - 3x$ by using Newton-Raphson Method.
b) Derive an interpolating polynomial for the given function $y = f(x)$ given by the table:

x	-1	1	4	6
$f(x)$	1	-3	21	127

c) Calculate the solution of the given system by using Gauss elimination method:
$2x + 3y + 2z = 2$,
$10x + 3y + 4z = 16$,
$3x + 6y + 2z = -6$.
d) Develop the solution of the given system of equations by using Croute's method:
$2x + y + z = 3$,
$x + 3y + z = -2$,
$x + y + 4z = -6$.
e) Calculate approximately, by trapezoidal rule, the integral $\int_0^1 (4x - 3x^2)\,dx$, by taking $n = 10$. Compute also the exact integral and find the absolute error.
f) Calculate $\int_0^2 \frac{1}{x^2+2x+10}\,dx$, by using Gauss-Legendre three-point formula.
g) Calculate $y(0.1)$, given $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1, h = 0.02$, by Euler's method.

h) Explain fixed point iteration method in order to find the root of the equation, $sinx = 10(x-1)$.

i) Determine $f(1.2)$ by using Newton's Forward difference Interpolation,

x	0	1	2	3	4
$f(x)$	1	1.5	2.2	3.1	4.3

j) Develop solution of $y(0.02)$ by using Euler's Modified method for the initial value problem $y'' = x^2 + y^2, y^{(0)} = 1$, by taking $h = 0.01$.

k) Solve by Gauss-Seidel iteration method,

$$10x - y - z = 13, x + 10y + z = 36, x + y - 10z = -35.$$

l) Determine the inverse of the following matrix by Gauss-Jordan elimination procedure :

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

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Evaluate a cubic spline approximation for the function defined by the following data, **(16)**

x	0	1	2	3
$f(x)$	1	2	33	244

Q4 Evaluate $y(1.4)$ using Runge-Kutta method of fourth order for the initial value problem, **(16)**
$\frac{dy}{dx} = x^2 + y^2, y(1) = 0$, by taking $h = 0.1$.

Q5 Calculate all Eigen values of the matrix, by using power method and find the Eigen vector of smallest Eigen value **(16)**

$$A = \begin{bmatrix} 4 & 0 & 2 \\ 0 & -1 & 0 \\ 2 & 0 & 4 \end{bmatrix}.$$

Q6 Discuss solution of the Boundary Value problem $y'' + 4y = 0, y(0) = 0, y(1) = 1$ by using Finite difference method taking $h = 0.25, h = 0.125$ and compare with the exact solution. **(16)**