Roll No. | | | | | | | | | | | | |

Total No. of Pages : 02

Total No. of Questions : 09

B.Tech (ME) (Sem.–5)

NUMERICAL METHOD ANALYSIS/ NUMERICAL METHODS IN ENGG.

Subject Code : ME-309

M.Code : 59028

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) Define relative and absolute errors.

b) State Newton-Raphson method for nonlinear equation $f(x) = 0$.

c) Define Eigen value and Eigen vector of a matrix.

d) Write the Euler's method for solving the ordinary differential equation.

e) Write Newton-cote's quadrature formula.

f) What is the difference between Simpson 1/3 and Simpson 3/8 rule.

g) Write the governing equation of cubic splines.

h) State Lagrange's formula for equally spaced data points.

i) Write the difference between Euler's and modified Euler's method.

j) State the Laplace equation for the partial differential equation.

SECTION-B

2. Using Newton's iterative method, find the real root of $x \log_{10} x = 1.2$ correct to five decision places.

3. Determine $f(x)$ as a polynomial in x for the following data, using Newton's divided difference formulae.

x :	–4	–1	0	2
$f(x)$: 1245	33	5	9	1335

4. Use the method of least squares to fit the curve $f(t) = ae^{-3t} + be^{-2t}$ for the following data :

t :	0.1	0.2	0.3	0.4
$f(t)$:	0.76	0.58	0.44	0.35

5. Solve the following equation by Gauss elimination method :

$$2x + y + z = 10 \; ; \; 3x + 2y + 3z = 18 \; ; \; x + 4y + 9z = 16$$

6. Find all the eigen values and the eigen vector corresponding to the largest eigen value (only) of the matrix

$$\begin{bmatrix} 1 & 2 & -2 \\ 1 & 1 & 1 \\ 1 & 3 & -1 \end{bmatrix}$$

SECTION-C

7. a) Use Simpson's 1/3rd rule to find

$$\int_0^{0.6} e^{-x^2} dx$$

By taking seven ordinates.

b) From the table below, for what value of x, y is minimum? Also find this value of y.

x :	3	4	5	6	7	8
y :	0.205	0.240	0.259	0.262	0.250	0.224

8. Using Runge-Kutta method of fourth order, solve

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$$

with $y(0) = 1$ at $x = 0.2, 0.4$.

9. Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subjected to the condition $u(x, 0) = \sin \pi x$, $0 \le x \le 1$; $u(0, t) = u(1, t) = 0$. Carry out computations for two levels taking $h = 1/3$ and $k = 1/36$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.