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Total No. of Pages : 02

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**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  $1/3^{\text{rd}}$  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  $u(x, 0) = \sin \pi x$ ,  $0 \leq x \leq 1$  ;  $u(0, t) = u(1, t) = 0$ . 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.**