

Code No: 56083

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, May - 2019

NUMERICAL METHODS

(Automobile Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) State and prove the theorem for the convergency of a root of $f(x)=0$ by the iterative method.
b) Find a real root for $e^x \sin x = 1$, using Regula Falsi method. [8+7]
2. Apply Gauss-Seidel iteration method to solve the equations [15]
 $10x_1 + x_2 + x_3 = 12$; $2x_1 + 10x_2 + x_3 = 13$; $2x_1 + 2x_2 + 10x_3 = 14$

3. Fit a cubic spline to the following data

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

Hence find $f(0.5)$ and $f'(0.5)$. [15]

4. If the straight line $y = a+bx$ is the best fit to the set of points $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$
then show that
$$\begin{vmatrix} x & y & 1 \\ \sum x_i & \sum y_i & n \\ \sum x_i^2 & \sum y_i^2 & \sum x_i \end{vmatrix} = 0 \quad (i = 1, 2, \dots, n).$$
 [15]

- 5.a) Evaluate $\int_0^{\pi/2} e^{\sin x} dx$ taking $h = \pi/6$ using Trapezoidal rule.
b) From the following table, find the value of x for which y is maximum and find this value of y . [7+8]

x	1.2	1.3	1.4	1.5	1.6
y	0.9320	0.9636	0.9855	0.9975	0.9996

6. Find the successive approximate solution of the differential equation $y' = y$, $y(0) = 1$ by Picard's method and compare it with exact solution. [15]
7. Find the largest eigen value in modulus and the corresponding eigenvector of the matrix
$$\begin{bmatrix} -15 & 4 & 3 \\ 10 & -12 & 6 \\ 20 & -4 & 2 \end{bmatrix}$$
 using the power method. [15]
8. Find the solution of the parabolic equation $u_{xx} = 2u_t$ when $u(0, t) = u(4, t) = 0$ and $u(x, 0) = x(4 - x)$, taking $h = 1$. Find the values up to $t = 4$. [15]