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B.Tech.(EE/EEE) (Sem.–5)

NUMERICAL ANALYSIS

Subject Code : EE-311/AM-351

M.Code : 57027

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) State intermediate value property.

b) State the condition where Newton's method fails.

c) Using Euler's method, find $y(1)$, given that $y' = x + y$ and $y(0) = 1$ with $h = 1$.

d) Write the normal equations for fitting a straight line to the data using a method of least squares.

e) Show that Newton's method has quadratic rate of convergence.

f) Use Picard's method to solve $\frac{dy}{dx} = 2x + y^2$ upto third approximation where $y(0) = 0$.

g) Write the iterative formula for method of false position.

h) What is the condition of convergence of fixed point iteration method ?

i) Write a short note on finite difference method.

j) Use Taylor's series method to solve $\frac{dy}{dx} = 2x - 3y$ at $x = 0.1$, given that $y(0) = 1$.

SECTION-B

2. Use iteration method to obtain the root of equation $x^3 - 15x + 8 = 0$ correct to four decimal places.

3. Solve the following system of equation using the Gauss-elimination method :

$$3x - y + 2z = 12$$

$$x + 2y + 3z = 11$$

$$2x - 2y - z = 2.$$

4. Fit a curve of the form $y = ab^x$ to the given data :

$y(2) = 144$, $y(3) = 172.8$, $y(4) = 207.4$. $y(5) = 248.8$, $y(6) = 298.5$.

5. Using modified Euler's method, find an approximate value of $y(0.3)$, given that $y(0) = 0$ and

$$\frac{dy}{dx} = 1 - y + e^x$$

with $h = 0.1$

6. Find the value of $\frac{dy}{dx}$ at $x = 40$ from the following data :

x :	0	10	20	30	40
y :	1	0.984	0.939	0.866	0.766

SECTION-C

7. Use the method of triangularization to solve the system of equations

$$x + 3y + z = 3$$

$$x + 4y + 2z = 3$$

$$x + 2y - 3z = 6$$

8. For the given initial value problem (IVP), $\frac{dy}{dx} = x - y^2, y(0) = 1,$ estimate the value of $y(0.2)$ using Runge-Kutta method of fourth order with step size $h = 0.1$.

9. The velocities of a car running on a straight road from rest position at intervals of 2 minutes are given below :

Times (in minutes) :	2	4	6	8	10	12
Velocity (in km/hr) :	22	30	27	18	7	0

Find the total distance covered by the car in 12 minutes.

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.