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B.Tech (ECE) (Sem.–4)

NUMERICAL METHODS

Subject Code : BTEL-401

M.Code : 62021

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) If $U = 2V^6 - 5V$, find the percentage error in u at V = 1 if error in u at V = 1 if error in V is 0.05.

b) Show that the following rearrangement of equation $x^3 + 6x^2 + 10x - 20 = 0$ does not yield a convergent sequence of successive approximations by iteration method near $x = 1$ ..

c) Write Geometrical Interpretation of regula Falsi Method.

d) Construct a backward difference table for $y = \log x$ given that :

x :	10	20	30	40	50
y :	1	1.3010	1.4771	1.6021	1.6990

and find $\nabla^3 \log 40$, $\nabla^4 \log 50$

e) Write Newton's general interpolation formula.

f) Write normal equations for fitting the straight line using Method of least square method.

g) Write formula of Simpson's $\frac{1}{3}I$ rule for numerical integration.

h) Define Pivoting and types of pivoting.

i) Define initial value problem and Boundary value problem.

j) Write formula of Runga Kutta method of third order.

SECTION-B

2. Find a real root of $2x - \log_{10} x = 7$ correct to four decimal places using Newton Raphson Method.

3. Use Lagrange's Interpolation formula to fit a polynomial to the data :

x	-1	0	2	3
u_x	-8	3	1	12

Hence or otherwise find the value of u_1.

4. Fit the curve $pv^v = k$ to the following data :

p(kg/cm^2)	0.5	1	1.5	2	2.5	3
v(liters)	1620	1000	750	620	520	460

5. The velocity "v" of a particle at distance "s" from a point on its linear path is given in the following table :

s(m):	0	2.5	5	7.5	10	12.5	15	17.5	20
v(m/sec):	16	19	21	22	20	17	13	11	9

Estimate the time taken by the particle to traverse the distance of 20 meters.

6. Solve the system of equations

$x + y + z = 6$

$3x + (3 + \epsilon)\, y + 4z = 20$

$2x + y + 3z = 13$

Using Gauss Elimination method where ϵ is small such that $1 \pm \epsilon^2 = 1$. What happens if we do not use partial pivoting at second step?

SECTION-C

7. Find the largest Eigen value and the associated Eigen vector of the matrix A

$$\begin{bmatrix} 2 & 3 & 2 \\ 4 & 3 & 5 \\ 3 & 2 & 9 \end{bmatrix}$$ by Power's method.

8. Using Milne's method, solve $\frac{dy}{dx} = 1 + y^2$ with $y(0) = 0$, $y(0.2) = 0.2027$, $y(0.4) = 0.4228$, $y(0.6) = 0.6841$, obtain $y(0.8)$, $y(1)$ and $y(-0.2)$.

9. Obtain cubic spline for the following given data :

x :	0	1	2	3
$f(x)$:	2	-6	-8	2

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.