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EAST POINT COLLEGE OF ENGINEERING & TECHNOLOGY
An Autonomous Institution Affiliated to Visvesvaraya Technological University (VTU) Belagavi

USN | | | | | | | | | | |

25MTC21

Second Semester B.E. Degree Examination, June/July 2026
Numerical Methods

TIME:3 hrs. Max.Marks:100

Note: 1. Answer **any FIVE** full questions, choosing **ONE** question from **each MODULE.**
2. Formula Hand Books Permitted.
3. M: Marks, L: Bloom's level, C: Course outcomes.
4. Assume missing data suitably.

		Module-1	M	L	C
Q.1	a	Define the following with an example i) Absolute error, ii) Relative error, iii) Percentage error, iv)Round-off error and v) Truncation error.	6	L2	CO1
	b	By using Secant method find a real root of the equation $x^3 - 5x + 1 = 0$, carryout 4 approximations.	7	L3	CO1
	c	Apply Newton Raphson method, find the real root of the equation $xsinx + cosx = 0$ near $x = \pi$.	7	L3	CO1
		OR			
Q.2	a	By using Bisection method find a real root of the equation $x^3 - 4x + 1 = 0$ up to 5 approximations.	6	L2	CO1
	b	By using Regula-falsi method find a real root of the equation $xe^x - cosx = 0$ correct 3 decimal places.	7	L3	CO1
	c	Using Newton Raphson method, find the $\sqrt[3]{37}$, correct to 4 decimal places.	7	L3	CO1
		Module–2			
Q.3	a	Define vector norms- L_1, L_2, L_∞ with an example .	3	L2	CO2
	b	Solve the system of equations $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$ using the Gauss-Seidel method, taking (0, 0, 0) as an initial approximate. (Carryout 4 iterations).	7	L3	CO2
	c	Apply Jacobi method to find the eigen values and the corresponding eigen vectors of the matrix $A = \begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}$	10	L3	CO2
		OR			
Q.4	a	Define matrix norms- L_1, L_2, L_∞ with an example	3	L2	CO2
	b	Use Power method to find the numerically largest eigen value and the corresponding eigen vector of the matrix $A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}$ by taking $X^{(0)} = [1, 0, 0]^T$ as a initial vector. Carryout four approximations	7	L3	CO2
	c	Solve the system of equations $3x + y + z = 4$, $x + 2y + 2z = 3$, $2x + y + 3z = 4$, Using the LU-decomposition method.	10	L3	CO2

Module–3

Q.5 a) Apply Newton's forward Interpolation find y at $x = 3.5$ from the data — **6 | L2 | CO3**

X	3	4	5	6
y	6	24	60	120

b) Using Newton's divided difference interpolation find $f(4)$. Given that — **7 | L3 | CO3**

X	0	2	3	6
y	-4	2	14	158

c) Obtain the piecewise linear interpolating polynomial for the function $f(x)$ defined by the data: — **7 | L3 | CO3**

x	1	2	4	8
f(x)	3	7	21	73

hence find $f(3)$ and $f(7)$.

OR

Q.6 a) From the following data, find the number of men getting wages below Rs.15 using approximate interpolating formula. — **6 | L2 | CO3**

Wages in Rs.	0-10	10-20	20-30	30-40
Frequency	9	30	35	42

b) Find the interpolating polynomial by using Lagrange's formula and hence find $y(1)$. Given that — **7 | L3 | CO3**

X	0	2	3	6
y	-4	2	14	158

c) Obtain the piecewise interpolating polynomial for the function $f(x)$ defined by the data — **7 | L3 | CO3**

x	-2	0	1	3	4
f(x)	-23	1	4	82	193

hence find $f(-0.5)$ and $f(2.0)$

Module–4

Q.7 a) Solve $(1 + 2xycosx^2 - 2xy)dx + (sinx^2 - x^2)dy = 0$ — **6 | L2 | CO4**

b) Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 6e^{3x} + 7e^{-2x}$ — **7 | L3 | CO4**

c) Solve $y''' + y'' + 4y' + 4y = x^2 - 4x - 6$ — **7 | L3 | CO4**

OR

Q.8 a) Solve $y(2x - y + 1)dx + x(3x - 4y + 3)dy = 0$ — **6 | L2 | CO4**

b) Solve $\frac{d^2y}{dx^2} - 4y = \cosh(2x - 1) + 3^x$ — **7 | L3 | CO4**

c) Solve $y'' + 3y' + 2y = 4cos^2x$ — **7 | L3 | CO4**

Module–5

Q.9 a) Apply Modified Euler's method to find $y(0.2)$taking h=0.1 given that $\frac{dy}{dx} = 3x + \frac{y}{2}$, with $y(0) = 1$, find up to 2 approximations. — **6 | L2 | CO5**

b) Using Milne's Predictor-Corrector method find y(0.4), from $\frac{dy}{dx} = 2e^x - y$, given that $y(0)=2$, $y(0.1)=2.01$, $y(0.2)=2.04$, $y(0.3)=2.09$. — **7 | L3 | CO5**

c) Evaluate $\int_0^6 \frac{dx}{4x+5}$ by using Simpson's 1/3rd rule by dividing interval into 6 equal parts. — **7 | L3 | CO5**

		OR			
Q.10	**a**	Apply Taylor series find the value of $y(0.01)$ given that $\frac{dy}{dx} = x^2y - 1$, with $y(0) = 1$ up to 3rd degree terms.	**6**	**L2**	**CO5**
	b	Using Runge-Kutta method find$y$ at $x = 0.5$ given that $(x + y)\frac{dy}{dx} = 1,\ y(0.4) = 1$ by taking h=0.1.	**7**	**L3**	**CO5**
	c	Evaluate $\int_4^{5.2} log_e x\ dx$ by using weddle'srule by dividing interval into 6 equal parts.	**7**	**L3**	**CO5**

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