

CBCS SCHEME

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1BMATS201

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

Numerical Methods : CSE Stream



Time: 3 hrs.

Max. Marks: 100

- Note:* 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. M : Marks, L: Bloom's level, C: Course outcomes.
 3. VTU Formula Hand Book is permitted.

Module – 1				M	L	C
Q.1	a.	Define Error, Absolute error, Relative error and Percentage errors.		6	L2	CO1
	b.	Using Newton Raphson method find the real root of $xe^x - 2 = 0$ correct to four decimal places.		7	L3	CO1
	c.	Using Bisection method find the real root of the equation $x^3 - 2x - 5 = 0$. Carry out 4 iterations.		7	L3	CO1

OR

Q.2	a.	Round off the number 37.46235 to 4 significant figures and compute (i) Absolute error, (ii) Relative error (iii) percentage error		6	L2	CO1
	b.	Find a real root of the equation $x \log_{10} x - 1.2 = 0$ by regula falsi method correct to four decimal places.		7	L3	CO1
	c.	Using Secant method find the real root of the equation $x^3 + x^2 - 1 = 0$. Carry out 4 iterations.		7	L3	CO1

Module – 2

Q.3	a.	Find the condition number of an invertible matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ with respect to L_1 norm.		5	L3	CO1
	b.	Apply LU Decomposition method to solve $x + y + z = 1$; $3x + y - 3z = 5$; $x - 2y - 5z = 10$		8	L3	CO1
	c.	Find the largest eigen value and eigen vector of the matrix A using Rayleigh's power method by taking the initial vector as $[1,1,1]'$ $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$		7	L3	CO1

OR

Q.4	a.	Verify whether the following system of linear equations is well poised or not using spectral norm $\begin{bmatrix} 2.1 & 1.8 \\ 6.2 & 5.3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 2.1 \\ 6.2 \end{bmatrix}$		6	L2	CO1
	b.	Solve by Gauss Seidel method $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$. Carry out 5 iterations taking $X' = (1,1,1)$		7	L3	CO1

Q.4	c.	Using Jacobi's method find the approximate eigen values and eigen vectors of $A = \begin{bmatrix} 4 & 1 \\ 1 & 4 \end{bmatrix}$	7	L3	CO1
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Module – 3

Q.5	a.	From the following table find the number of students who obtained marks between 40 and 45	6	L3	CO1
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Marks	30-40	40-50	50-60	60-70	70-80
No of students	31	42	51	35	31

	b.	Obtain the piecewise linear interpolating polynomial for the data and hence interpolate at $x = 0.5$ and 2.5	7	L3	CO1
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x	0	1	2	3
f(x)	1	2	5	10

	c.	Evaluate $f(3)$ from the following table using Newton's divided interpolation formulae.	7	L3	CO1
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x	0	1	4	8	10
f(x)	-5	-14	-125	-21	355

OR

Q.6	a.	Apply appropriate interpolation formula to find $y(3)$.	6	L3	CO1
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x	0	2	4	6	8	10
y	0	4	56	204	496	980

	b.	Obtain the piecewise quadratic interpolating polynomial for the data and hence find $f(-0.5)$ and $f(2)$	7	L3	CO1
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x	-2	0	1	3	4
f(x)	-23	1	4	82	193

	c.	Find the Polynomial $f(x)$ using Lagrange's Interpolation formula given	7	L3	CO1
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x	0	1	2	5
f(x)	2	3	12	147

Module – 4

Q.7	a.	Solve $\cos x (e^y + 1)dx + \sin x e^y dy = 0$.	6	L3	CO2
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	b.	Solve $\frac{d^2y}{dx^2} - 4y = \cosh(2x - 1) + 3^x$	7	L3	CO2
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	c.	Solve $(D^2 + 3D + 2)y = 1 + 3x + x^2$.	7	L3	CO2
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OR

Q.8	a.	Solve $\frac{dy}{dx} + \frac{y}{x} = x^2y^6$	6	L3	CO2
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	b.	Solve $\left(3x^2y + \frac{y}{x}\right)dx + (x^3 + \log_e x)dy = 0$	7	L3	CO2
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	c.	Solve $(D^2 - 4)y = e^x + \cos 2x$.	7	L3	CO2
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Module – 5

Q.9	a.	Using Simpson's one third rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking seven ordinates.	6	L3	CO2
	b.	Evaluate $y(1.4)$ by Milne's method, for the differential equation, $\frac{dy}{dx} = x^2(1+y)$ given that $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$, and $y(1.3) = 1.979$.	7	L3	CO2
	c.	Find the solution of $\frac{dy}{dx} = x^2y - 1$, by Taylor's series method at $x = 0.2$ considering up to 4^{th} degree terms, given that $y(0) = 1$.	7	L3	CO2
OR					
Q.10	a.	Using Runge Kutta method of 4^{th} order solve $\frac{dy}{dx} = \frac{(y^2 - x^2)}{(y^2 + x^2)}$ with $y(0) = 1$ at $x = 0.2$.	6	L3	CO2
	b.	Applying Modified Euler's method, find $y(0.2)$ by solving the equation $\frac{dy}{dx} = x - y^2$, with $y(0) = 1$ taking $h = 0.1$	7	L3	CO2
	c.	Evaluate $\int_0^1 \frac{x}{1+x^2} dx$ using Weddle's rule ($n = 6$)	7	L3	CO2
