EAST POINT COLLEGE OF ENGINEERING & TECHNOLOGY

An Autonomous Institution Affiliated to Visvesvaraya Technological University (VTU) Belagavi

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

EPMTS201

Second Semester B.E. Degree Examination, July 2025

MATHEMATICS-II FOR CSE STREAM

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.

		Module-1	M	L	C
Q.1	a	Solve: $\frac{dy}{dx} + y\,cotx = cosx$	6	L2	CO1
	b	Solve: $\frac{dy}{dx} + \frac{y\,cosx+siny+y}{sinx+xcosy+x} = 0$	7	L2	CO1
	c	When a resistance R ohms connected in series with an inductance L henries with an emf of E volts, the current I amperes at time t is given by $L\frac{di}{dt} + Ri = E$. If E=100sint volts and i=0 when t=0, find I as function of t.	7	L3	CO1
		OR			
Q.2	a	Prove that the system of parabolas $y^2 = 4a(x+a)$ is self orthogonal.	7	L2	CO1
	b	Solve $xyp^2 - (x^2 + y^2)p + xy = 0$.	7	L2	CO1
	c	Evaluate $\frac{dy}{dx} + \; tanx - y^3\,secx = 0$.	6	L3	CO5
		Module–2			
Q.3	a	Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x+y+z)\,dy\,dx\,dz$	6	L2	CO2
	b	Evaluate $\int_{0}^{1}\int_{x}^{\sqrt{x}} xy\,dy\,dx$ by changing the order of integration.	7	L2	CO2
	c	Prove that $\beta(m,n) = \frac{\Gamma(m).\Gamma(n)}{\Gamma(m+n)}$	7	L2	CO2
		OR			
Q.4	a	Evaluate $\int_{0}^{\infty}\int_{0}^{\infty} e^{-(x^2+y^2)}dx\,dy$ by changing to polar coordinates	6	L2	CO2
	b	Find the area of the ellipse $x^2/a^2 + y^2/b^2 = 1$ by using double integration	7	L3	CO2

<table>
<tr><td></td><td>c</td><td>Express the following integrals in terms of beta functions $\int_0^{\frac{\pi}{2}} \sqrt{\cot\phi}\, d\phi$ and evaluate.</td><td>7</td><td>L2</td><td>CO2</td></tr>
<tr><td colspan="6">Module–3</td></tr>
<tr><td>Q.5</td><td>a</td><td>Prove that the intersection of any two subspaces of vector space V over a field F is also a subspace of V.</td><td>6</td><td>L2</td><td>CO3</td></tr>
<tr><td></td><td>b</td><td>Given the basis $\{(1,1,1,1),(1,\ 2,4,5),(1,\ -3,\ -4,-2)\}$ .Use Gram-Schmidt process on to obtain orthonormal basis of R^3 .</td><td>7</td><td>L3</td><td>CO3</td></tr>
<tr><td></td><td>c</td><td>Find the matrix of Linear transformation $T: V_2(R) \to V_3(R)$ defined by $T(x,y) = (x+y, x, 3x-y)$ with respect to $B_1 = \{(1,1),(3,1)\}$ $B_2 = \{(1,1,1),(1,1,0),(1,0,0)\}$.</td><td>7</td><td>L2</td><td>CO3</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.6</td><td>a</td><td>Let $S = \{(1,\ -3,\ 2),\ (2,\ 4,\ 1),\ (1,\ 1,\ 1)\}$ be a subset of $V_3(R)$. Show that the vector $(3,\ -7,\ 6)$ is in L[S].</td><td>6</td><td>L2</td><td>CO3</td></tr>
<tr><td></td><td>b</td><td>Find the dimension and basis of the subspace spanned by the vectors $(2,4,2),(1,-1,0),(1,2,1)$ & $(0,3,1)$ in $V_3(R)$.</td><td>7</td><td>L2</td><td>CO3</td></tr>
<tr><td></td><td>c</td><td>Find the range, null space, rank and nullity of the linear transformation T: $R^3 \to R^2$, defined by T(x, y, z) = (y - x, y - z) and verify Rank nullity theorem.</td><td>7</td><td>L2</td><td>CO3</td></tr>
<tr><td colspan="6">Module–4</td></tr>
<tr><td>Q.7</td><td>a</td><td>Find the real root of the equation x^3-2x-5=0 correct to three decimal places using Newton- Raphson's method.</td><td>6</td><td>L2</td><td>CO4</td></tr>
<tr><td></td><td>b</td><td>The area of circle (A) corresponding to diameter (D) is given below.
<table>
<tr><td>D</td><td>80</td><td>85</td><td>90</td><td>95</td><td>100</td></tr>
<tr><td>A</td><td>5026</td><td>5674</td><td>6362</td><td>7088</td><td>7854</td></tr>
</table>
Find the area corresponding to diameter 105 using the appropriate interpolation formula.</td><td>7</td><td>L3</td><td>CO4</td></tr>
<tr><td></td><td>c</td><td>Evaluate $\int_0^1 \frac{x\,dx}{1+x^2}$ by dividing the given interval into 6 equal using Simpson's 3/8th rule and hence find log 2.</td><td>7</td><td>L3</td><td>CO4</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.8</td><td>a</td><td>Use Newton's divided difference formula to find $f(4)$given the data:
<table>
<tr><td>x</td><td>0</td><td>2</td><td>3</td><td>6</td></tr>
<tr><td>f(x)</td><td>-4</td><td>2</td><td>14</td><td>158</td></tr>
</table></td><td>6</td><td>L2</td><td>CO4</td></tr>
<tr><td>x value</td><td>b</td><td>Use Lagrange's formula, find the interpolating polynomial
<table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>5</td></tr>
<tr><td>f(x)</td><td>2</td><td>3</td><td>12</td><td>147</td></tr>
</table></td><td>7</td><td>L2</td><td>CO4</td></tr>
</table>

	c	Find the approximate value of $\int_0^{\pi/2} \sqrt{\cos\theta}\, d\theta$ by **Simpson's 1/3rd** rule by dividing $\left[0, \frac{\pi}{2}\right]$ into 6 equal parts.	7	L3	CO4
		Module–5			
Q.9	a	Using **Euler's modified method** find y (0.2). Solving the equation $\frac{dy}{dx} = x + \lvert\sqrt{y}\rvert$, with $y = 1$ at $x = 0$, taking h=0.2 by two modifications.	6	L2	CO5
	b	Solve $\frac{dy}{dx} = 3x + \frac{y}{2}$, y(0)=1. Compute y(0.2) by taking h=0.2 Find y(0.1) with h=0.1 using **Runge- Kutta** method of fourth order.	7	L2	CO5
	c	Apply **Milne's method** to compute y(1.4) correct to 4 decimal places given $\frac{dy}{dx} = x^2 + \frac{y}{2}$, $y(1) = 2, y(1.1) = 2.2156, y(1.2) = 2.4649$, $y(1.3) = 2.7514$. Use corrector formula twice.	7	L3	CO5
		OR			
Q.10	a	Use **Taylor's series method** find y at x=0.1 given $\frac{dy}{dx} = 2y + 3e^x$ Compute $y(0) = 0$, up to third degree.	6	L2	CO5
	b	Using **Runge-Kutta** method of fourth order, find y (0.2) to solve $\frac{dy}{dx} = \frac{y-x}{y+x}$ with $y(0) = 1$ taking $h = 0.2$.	7	L2	CO5
	c	Using **Milne's method** find y(0.8) given that $\frac{dy}{dx} = x - y^2$, $y(0) = 0, y(0.2) = 0.02$, y(0.4)=0.0795, y(0.6)=0.1762.	7	L2	CO5

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