MAKE-UP EXAM

USN

BMATE201

Second Semester B.E/B.Tech. Degree Examination, Nov./Dec. 2023

Mathematics - II for EEE 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**
1	a.	If $\phi = x^2 + y - z - 1$ find grad ϕ at (1, 0, 0). Also find its magnitude.	6	L3	CO1
	b.	Find the divergence and curl of the vector : $\vec{F} = (xyz)\hat{i} + (3x^2y)\hat{j} + (xz^2 - y^2z)\hat{k}$ at (2, –1, 1).	7	L2	CO1
	c.	Show that $\vec{F} = (y^2 - z^2 + 3yz - 2x)\hat{i} + (3xz + 2xy)\hat{j} + (3xy - 2xz + 2z)\hat{k}$ is both solenoidal and irrotational.	7	L2	CO1
		OR			
2	a.	Suppose $\vec{F} = x^3\hat{i} + y\hat{j} + z\hat{k}$ is the force field. Find the work done by $\vec{F}$ along the line from (1, 2, 3) to (3, 5, 7).	6	L2	CO1
	b.	Verify Green's theorem in the xy – plane for $\int_c (xy + y^2)dx + x^2dy$, where C is the closed curve of the region bounded by y = x and $y = x^2$.	7	L3	CO1
	c.	Using modern mathematical tools, write the code to find the divergence of $\vec{F} = x^2y\hat{i} + yz^2\hat{j} + x^2z\hat{k}$.	7	L3	CO5
		Module – 2			
3	a.	Define a subspace. Show that a subset $S = \{x_1, x_2, x_3 \mid x_1 + x_2 + x_3 = 0\}$ of $V_3(R)$ is a subspace of $V_3(R)$.	6	L2	CO2
	b.	Prove that in $V_3(R)$ the vectors {(1, 2, 1) (3, 1, 5), (3,–4, 7)} are linearly independent.	7	L2	CO2
		Find <p, q> and $\|P\|$. Given $P(x) = x^2 - x$, q(x) = x + 1, the innerproduct space $<p, q> = \int_{-1}^{1} P(x);q(x)dx$.	7	L2	CO2

		OR			
4	a.	Let $T : U \to V$ be a linear transformation defined by, $T(x, y, z) = \{(x + y, x - y, 2x + z)/x, y, z, \in R)$. Verify Rank Nullity theorem.	6	L2	CO2
	b.	Explain the vector $(2, -5, -1)$ as a linear combination of the vectors $(1, 2, 3)(2, 1, 1)\ (1, 3, 2)$ of $V_3(R)$.	7	L2	CO2
	c.	Using the modern mathematical tool write the code to represent the reflection transformation $T : R^L \to R^2$ and to find the image of vector (10, 0) when it reflected about the y – axis.	7	L3	CO5
		Module – 3			
5	a.	Find the Laplace transform of $\left(\frac{\sin 2t}{\sqrt{t}}\right)^2$.	6	L2	CO3
	b.	Find $L^{-1}\left\{\frac{1}{s(s^2+1)}\right\}$ using convolution theorem.	7	L2	CO3
	c.	Express $f(t) = \begin{cases} \cos t & 0 < t < \pi \\ \cos 2t & \pi < t < 2\pi \\ \cos 3t & t > 2\pi \end{cases}$ interms of unit step function and find $L\{f(t)\}$.	7	L3	CO3
		OR			
6	a.	Find the inverse Laplace transform of i) $\frac{(s+2)^3}{s^6}$ ii) $\frac{2s+5}{4s^2+25}$.	6	L2	CO3
	b.	Solve by Laplace transform method : $y'' + 4y' + 3y = e^{-t}$; $y(0) = 1 = y'(0)$.	7	L2	CO3
	c.	Find the Laplace transform of the square wave function of period a, defined by $f(t) = \begin{cases} K & 0 < t < a/2 \\ -K & a/2 < t < a \end{cases}$.	7	L2	CO3
		Module – 4			
7	a.	Evaluate $\int_2^7 \left(\frac{1}{x}\right) dx$, using Trapezodial rule, taking n = 5.	6	L3	CO4
	b.	Find the real toot of the equation $e^x - 3x - \sin x = 0$ by the Regula – Falsi method between 0 and 1. (carry out three iterations) x is in radions.	7	L2	CO4
	c.	Find y at x = 1 using Newton divided difference formula for the following data : x: 0, 2, 3, 4, 7, 9 y: 4, 26, 58, 112, 466, 922	7	L2	CO4

OR

8 **a.** Evaluate : $\int_{2}^{\pi/2} \cos x \, dx$, using Simpson's $(1/3)^{rd}$ rule with n = 8 [x in radian]. — 6 — L3 — CO4

b. Construct Newton's forward interpolation polynomial for the data : — 7 — L2 — CO4

x	0	1	2	3	4
f(x)	3	6	11	18	27

c. Find y when x = 10 for the following data by using Kagrange's interpolation formula : — 7 — L2 — CO4

x	5	6	9	11
y	12	13	14	16

Module – 5

9 **a.** Using Taylor's method to find y(0.2) by considering the terms upto 4th degree, given $\frac{dy}{dx} - 2y - 3e^x = 0$; y(0) = 0. — 6 — L3 — CO4

b. Given $\frac{dy}{dx} = x + y$; y(0) = 1. Compute y(0.2) using Runge – Kutta 4th order method [h = 0.2]. — 7 — L2 — CO4

c. Apply Milne's predictor and corrector method find y at x = 2 given $\frac{dy}{dx} = \frac{2y}{x} (x \neq 0)$ — 7 — L2 — CO4

x	1	1.25	1.5	1.75
y	2	3.13	4.5	6.13

OR

10 **a.** Using Modified Euler's method to find y at x = 0.2 given $y' = \frac{x - y}{2}$; y(0) = 1 [h = 0.1]. — 6 — L3 — CO4

b. Find y(1.1) by using Runge-Kutta method of fourth order. Given $\frac{dy}{x} = x(y)^{1/3}$; y(1) = 1 [take h = 0.1]. — 7 — L2 — CO4

c. Using modern mathematical tools, write a code to find y(0.1) given $\frac{dy}{dx} = x - y$, y(0) = 1, by Taylor's series. — 7 — L3 — CO5

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