



**Department of Mathematics**

<b>Course: Vector Calculus, Laplace Transform and Numerical Methods</b>	<b>TEST-I</b>	<b>Maximum Marks: 50</b>
<b>Course Code: MA221TA</b>	<b>Second Semester 2023-2024 Branch: EC, EE, EI, ET</b>	<b>Time: 2 PM to 3:30 PM Date: 13/05/2024</b>

*Instructions to candidates: Answer all questions.*

Q.No.	Question	M	BT	CO
1a	Transform the following signal in time into the signal in frequency: $f(t) = e^{-4t} \int_0^t t \sin 3t dt + \sin^2(2t + 1)$	7	L1	1
1b	Evaluate $\int_0^\infty e^{-t} \frac{\sin t}{t} dt$ .	3	L2	2
2a	Express the following function in terms of Heaviside unit step function and hence evaluate its Laplace transform. $f(t) = \begin{cases} \cos t, & 0 < t < \pi \\ 1, & \pi < t < 2\pi \\ \sin t, & t > 2\pi \end{cases}$	7	L2	2
2b	Find $L[(t - 1)^2 \delta(t - 3)]$ .	3	L1	2
3	Find the Laplace transform of half rectified sine wave function $I = \begin{cases} E \sin \omega t, & 0 < x < \frac{\pi}{\omega} \\ 0 & \frac{\pi}{\omega} < x < \frac{2\pi}{\omega} \end{cases}$ where $E$ and $\omega$ are constants, $f\left(t + \frac{2\pi}{\omega}\right) = f(t)$ .	10	L3	3
4a	Using convolution theorem, obtain the inverse Laplace transform of the function: $F(s) = \frac{s}{(s^2+9)^2}$	07	L2	3
4b	Find the inverse Laplace transform of the function $F(s) = \log\left(1 - \frac{a^2}{s^2}\right)$ .	3	L2	2
5	Using Laplace transform method solve the differential equation: $y'' + 4y' + 3y = e^{-t}, y(0) = 1 = y'(0)$ .	10	L3	4

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

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Marks Distributions	Particulars	CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	Max Marks	7	16	17	10	10	20	20	--	--	--