SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)
Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai
Accredited by NAAC-UGC with 'A++' Grade (Cycle III) &
Accredited by NBA (B.E - CSE, EEE, ECE, Mech & B.Tech.IT)
COIMBATORE-641 035, TAMIL NADU

DEPARTMENT OF MATHEMATICS

CourseCode:	**23MAT103**
CourseName:	**DIFFERENTIAL EQUATIONS AND TRANSFORMS**
Year/Sem:	**I/II**

QUESTION BANK
UNIT-V

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UNIT - V

Unit - V / Part - A / 2 Marks				
S.No	Questions	Mark Splitup	K – Level	CO
1.	Define Laplace Transform of $f(t)$.	2	K1	CO5
2.	Change of scale of Laplace Transform. (or) If $L[f(t)] = F(s)$, then $L[f(at)] = \frac{1}{a} F\left(\frac{s}{a}\right), a > 0$.	2	K1	CO5
3.	State and prove First Shifting property.	2	K1	CO5
4.	Find $L[t \sin at]$	2	K1	CO5
5.	Find $L[t^2 e^{-3t}]$	2	K1	CO5
6.	$L[\sin^2 2t]$	2	K1	CO5
7.	Find $L[\sin 5t \cos 2t]$	2	K1	CO5
8.	Find $L\left[\frac{\sin at}{t}\right]$. Hence, show that $\int_0^\infty \frac{\sin t}{t} dt = \frac{\pi}{2}$	2	K1	CO5
9.	Find $L[te^{-t} \sin t]$	2	K1	CO5
10.	Find $L[t \sin 3t \cos 2t]$	2	K1	CO5
11.	Find the inverse Laplace Transforms of $\frac{s-3}{s^2+4s+13}$	2	K1	CO5
12.	State Initial and Final value theorems.	2	K1	CO5
13.	Find the Laplace Transform of Unit step function.	2	K1	CO5
14.	Verify the Initial value theorem for the function $f(t) = ae^{-bt}$.	2	K1	CO5
15.	State Convolution Theorem in Laplace Transform.	2	K1	CO5

Unit - V / Part - B / 16, 8 Marks				
S.No	Questions	Marks Splitup	K – Level	CO
1.	Find $L\left[\frac{\cos at - \cos bt}{t}\right]$	8	K2	CO5
2.	Find $L\left[\frac{1-e^t}{t}\right]$	8	K2	CO5
3.	Verify the initial and final value theorem for the function $f(t) = 1 + e^{-t}(\sin t + \cos t)$.	4	K2	CO5
4.	Verify the initial and final value theorem for the function $f(t) = 3e^{-2t}$.	4	K2	CO5
5.	Find the Laplace transform of the periodic function $f(t) = \begin{cases} t & 0 \le t \le a \\ 2a - t, & a < t \le 2a \end{cases}$ and $f(t + 2a) = f(t)$.	8	K2	CO5
6.	Find the Laplace transform of the periodic function $f(t) = \begin{cases} t & 0 \le t \le 1 \\ 2 - t, & 1 < t \le 2 \end{cases}$ and $f(t + 2) = f(t)$.	8	K2	CO5

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7.	Find the Laplace transform of the square wave given by $f(t)=\begin{cases} E, & 0<t<\frac{T}{2} \\ -E, & \frac{T}{2}\le t\le T \end{cases}$ and $f(t+T)=f(t)$.	8	K2	CO5
8.	Find the Laplace transform of the square wave given by $f(t)=\begin{cases} 1, & 0<t<\frac{a}{2} \\ -1, & \frac{a}{2}\le t\le a \end{cases}$ and $f(t+a)=f(t)$.	8	K2	CO5
9.	Find the Laplace transform of the half wave rectifier $f(t)=\begin{cases} \sin\omega t, & 0<t\le\frac{\pi}{\omega} \\ 0, & \frac{\pi}{\omega}<t<\frac{2\pi}{\omega} \end{cases}$, and $f\left(t+\frac{2\pi}{\omega}\right)=f(t)$.	8	K2	CO5
10.	Using convolution theorem find $L^{-1}\left[\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right]$	8	K2	CO5
11.	Using convolution theorem find $L^{-1}\left[\frac{s^2}{(s^2+4)(s^2+9)}\right]$	8	K2	CO5
12.	Using convolution theorem find $L^{-1}\left[\frac{s}{(s^2+a^2)^2}\right]$	8	K2	CO5
13.	Using convolution theorem find $L^{-1}\left[\frac{1}{(s+1)(s^2+1)}\right]$	8	K2	CO5
14.	Using convolution theorem find $L^{-1}\left[\frac{s^2}{(s^2+a^2)^2}\right]$	8	K2	CO5
15.	Using convolution theorem find $L^{-1}\left[\frac{1}{(s^2+a^2)^2}\right]$	8	K2	CO5
16.	Solve the difference equation $\frac{d^2y}{dt^2}-3\frac{dy}{dt}+2y=e^{-t}$ with $y(0)=1$ and $y'(0)=0$, using Laplace transform.	8	K2	CO5
17.	Using Laplace transform, solve $\frac{d^2y}{dt^2}+9y=\cos 2t$ given $y(0)=1$, $y\left(\frac{\pi}{2}\right)=-1$.	8	K2	CO5
18.	Solve $y''+5y'+6y=2$, $y(0)=0$, $y'(0)=0$ using Laplace transform.	8	K2	CO5
19.	Using Laplace transforms, solve $y''+y'=t^2+2t$, $y(0)=4$, $y'(0)=-2$.	8	K2	CO5
20.	Using Laplace transform, solve $(D^2-3D+2)y=e^{-3t}$ given $y(0)=1$ and $y'(0)=-1$	8	K2	CO5
21.	Solve $\frac{d^2x}{dt^2}-3\frac{dx}{dt}+2x=2$, given $x=0$ and $\frac{dx}{dt}=5$ for $t=0$, using Laplace transform method.	8	K2	CO5