Course Code: 2030003 **Roll No:** **MLRS- R20**

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
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II B.Tech I Sem Regular End Examination, February-2022

Laplace Transforms Series Solutions and Complex Variables
(EEE & ECE)

Max. Marks: 70

Note: 1. Question paper consists: Part-A and Part-B.
2. In Part – A, answer all questions which carries 20 marks.
3. In Part – B, answer any one question from each unit.
Each question carries 10 marks and may have a, b as sub questions.

PART- A

(10*2 Marks = 20 Marks)

1.	a)	Find the Laplace Transform of Unit impulse function.	2M	CO1	U
	b)	State the conditions for the existence of a Laplace Transform,	2M	CO1	R
	c)	Discover the Fourier coefficient b_1 for $f(x)=\begin{cases} 0 & , for \ -\pi < x < 0 \\ \sin x & , for \ 0 < x < \pi \end{cases}$	2M	CO2	U
	d)	Brief about Half range sine series expansion of a function.	2M	CO2	U
	e)	Define ordinary point and singular point of a Differential Equation.	2M	CO3	R
	f)	Write Bessel's Differential equation of order n.	2M	CO3	U
	g)	Define an analytic function.	2M	CO4	R
	h)	Write Cauchy Riemann equations in Cartesian coordinates.	2M	CO4	U
	i)	State Cauchy integral theorem.	2M	CO5	R
	j)	Write a short note on the types of singularities.	2M	CO5	R

PART- B

(10*5 Marks = 50 Marks)

2	a)	Evaluate $L^{-1}\left[\frac{s+2}{\left(s^2+4s+5\right)^2}\right]$	5M	CO1	U
	b)	Using Laplace transforms evaluate the integral $\int_0^\infty te^{-t}Sin2t\ dt$	5M	CO1	AP

OR

3		Using convolution theorem find $L^{-1}\left[\frac{1}{\left(s^2+a^2\right)^2}\right]$	10M	CO1	AN

4	a)	Find the Fourier series for the function $f(x)=e^{-x}$ in $0<x<2\pi$.	5M	CO2	U
	b)	Find the Fourier series expansion of $f(x)=x\cos x$ in $(-\pi,\pi)$.	5M	CO2	AP
		OR			
5		Obtain Fourier series for the function given by $f(x)=\begin{cases}1+\frac{2x}{\pi}, & -\pi\le x\le 0\\ 1-\frac{2x}{\pi}, & 0\le x\le\pi\end{cases}$	10M	CO2	AN
6		Prove that $J_{\frac{1}{2}}(x)=\sqrt{\frac{2}{\pi x}}\,(\sin x)$	10M	CO3	AP
		OR			
7		State and prove Orthogonality of Bessel functions.	10M	CO3	AN
8	a)	Determine the Analytic function $f(z)$ whose real part is $e^{-x}(x\sin y-y\cos y)$.	5M	CO4	AP
	b)	Prove that $f(z) = \sin z$ is analytic everywhere in the complex plane, hence find $f^{l}(z)$.	5M	CO4	U
		OR			
9		Show that the function $f(z)=\sqrt{\lvert xy\rvert}$ is not analytic at the origin even though Cauchy Riemann equations are satisfied thereat.	10M	CO4	AN
10	a)	Using Cauchy's integral formula, evaluate the integral $\oint_C \frac{e^{2z}}{(z+1)^4}dz$, where $c:\lvert z-1\rvert=3$	5M	CO5	AP
	b)	Evaluate $\oint_C \frac{\sin\pi z^2+\cos\pi z^2}{(z-1)^2(z-2)}dz$ where $c:\lvert z\rvert=3$	5M	CO5	U
		OR			
11		Find the Laurent's Series of the function $f(z)=\frac{7z-2}{(z+1)z(z-2)}$ in the region $1<\lvert z+1\rvert<3$	10M	CO5	AN

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