Course Code: 2030412 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 Supplementary Examination, July-2022
Signals and Systems
(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)	Show that the sinusoidal signals with fundamental and harmonic frequencies are orthogonal to each other.	2M	CO1	BL1
	b)	Evaluate the following integrals. $\int_{-1}^{1}\left(4t^2+2t\right)\delta(t-2)\,dt$	2M	CO1	BL2
	c)	Give the relation between trigonometric and exponential Fourier series coefficients.	2M	CO2	BL1
	d)	Find the Fourier transform of unit step function.	2M	CO2	BL2
	e)	Give the conditions for distortion less transmission.	2M	CO3	BL1
	f)	Define convolution and correlation. Give the relationship between convolution and correlation.	2M	CO3	BL2
	g)	List the properties of region of convergence of a Laplace transform.	2M	CO4	BL2
	h)	Find the ZT of following discrete time sequence. $x(n)=\{\underset{\uparrow}{1}, 1, 1, 1, 1\}$.	2M	CO4	BL1
	i)	Fin the Nyquist sampling rate of the following analog signal. $x(t)=\cos(100\pi t).\sin(200\pi t)$	2M	CO5	BL3
	j)	Give the statement of Perceval's energy and power theorem.	2M	CO5	BL2

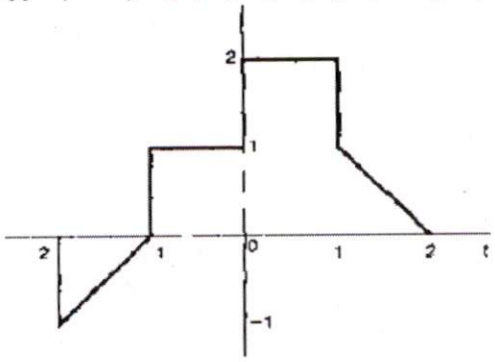
PART- B

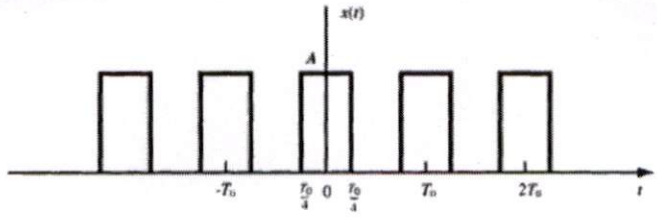
(10*5 Marks = 50 Marks)

2	a)	Compute the mean square error in signal approximation using orthogonal functions. Suggest how to minimize the mean square error.	5M	CO1	BL1
	b)	Find whether the following signals are energy or power or neither. (i) $x(n)=(-2)^n u(-n-1)$; (ii) $x(t)=e^{2t}u(-t)$ (iii) $x(t)=e^{-j5\pi t}$	5M	CO1	BL2

OR

3		A continuous time signal shown below, perform the following operations (i) $x(t-1)$ (ii) $x(2-t)$ (iii) $x(2t+1)$ (iv) $x(4-t/2)$	10M	CO1	BL1



4	a)	Evaluate the Fourier transform of the following signals. (i) $x(t)=e^{-at}\cos(\omega_0 t)\,u(t)$	5M	CO2	BL2
	b)	State and prove the time convolution property of Fourier transform.	5M	CO2	BL1
		OR			
5		Obtain the exponential Fourier series coefficients of the following periodic signal. Draw its magnitude and phase spectrum. 	10M	CO2	BL2
6	a)	What is an LTI system? Explain its properties. Derive an expression for the transfer function of an LTI system.	5M	CO3	BL2
	b)	With necessary mathematical equations describe the terms signal bandwidth and system bandwidth.	5M	CO3	BL1
		OR			
7		Compute the convolution between the following two signals using graphical method. $x(t)=u(t)-u(t-4)\;\; h(t)=u(t)-u(t-5)$	10M	CO3	BL3
8	a)	Find the Laplace transform of the following signal, sketch the pole zero plot with ROC of the following signals. $x_1(t)=e^{-4t}\,u(t)+e^{-3t}\,u(t)$	5M	CO4	BL2
	b)	Calculate the inverse Laplace transform of the following signal. (i) $X(s)=\dfrac{s^2+2s+5}{(s+3)(s+5)^2}$; *with ROC* $\mathrm{Re}(s)>-3$	5M	CO4	BL1
		OR			
9		Find the inverse Z-Transform of the following. $X(z)=\dfrac{z}{2z^2-3z+1}$; *case (i)* $\lvert z\rvert>1$ *(ii)* $\lvert z\rvert<1/2$ using partial fraction method.	10M	CO4	BL2
10	a)	List the properties of auto correlation function. Show that the Fourier transform of autocorrelation function is energy density spectrum for the case of energy signal.	5M	CO5	BL2
	b)	Find the cross correlation between the following signals $x_1(t)=e^{-4t}\,u(t)\;\; x_2(t)=e^{-5t}\,u(t)$	5M	CO5	BL3
		OR			
11		State and prove sampling theorem for low pass signals. With necessary equations and waveforms show how the analog signal reconstructed back from the sampled signal.	10M	CO5	BL1

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