R20

Code No: R20A0403

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, July/August 2023

Signals and Systems

(ECE)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1 ***A*** Define unit step, unit impulse, ramp and exponential signals. Write the relationship between the unit step and unit ramp functions. **[8M]**

B Sketch the following signals **[6M]**

(i) $5x(-2t + 5)$

(ii) $x(2t + 1)$

Where $x(t)$ is given in Fig.1.

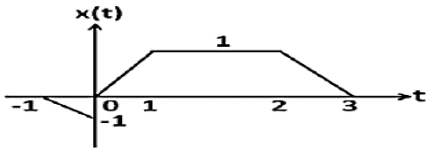


Fig.1.

OR

2 A train of rectangular pulses, making excursions from zero to one volt has duration of 2μs and are separated by interval 10μs. Assuming that the center of one pulse is located at t = 0, obtain the trigonometric Fourier series of pulse train. **[14M]**

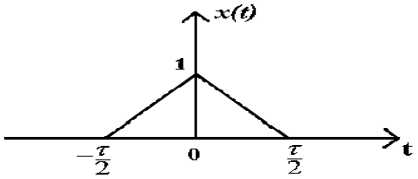
SECTION-II

3 ***A*** State and prove the following properties of Fourier Transform:

(i) Linearity **[2M]**

(ii) Time Shift **[2M]**

(iii) Frequency Shift **[2M]**



[8M]

B Find the Fourier transform of the signal shown in Fig. 2.

Fig. 2.

OR

4 ***A*** Write the comparative analysis between Fourier Transforms and Fourier Series. Mention their applications in real life. **[4M]**

	B	State and prove sampling theorem and Nyquist criterion for the Reconstruction of original signal from its samples.	**[10M]**

SECTION-III

5	***A***	Write the Classification of systems based on certain properties.	**[8M]**
	B	Investigate the causality, memory less and stability of system $h(t) = e^{-3\|t\|}$	**[6M]**

OR

6	***A***	Explain the filter characteristics of LTI system.	**[7M]**
	B	The input and output of a causal LTI system are related by the differential equation: $\frac{d^2y(t)}{dt^2} + \frac{6dy(t)}{dt} + 8y(t) = 2x(t)$ Find the impulse response of the system.	**[7M]**

SECTION-IV

7	***A***	Explain the significance of convolution and correlation in real world applications. Also develop the relation between them.	**[7M]**
	B	Perform the Convolution: $y(n) = x(n) * h(n)$where $x(n) = \beta^n u(n)$, and $h(n) = \alpha^n u(n)$.	**[7M]**

OR

8	***A***	Derive the following properties of convolution integral:	
		(i) Commutative	**[2M]**
		(ii) Associative	**[2M]**
		(iii) Distributive	**[2M]**
	B	Derive the power density spectrum of periodic signal.	**[8M]**

SECTION-V

9	***A***	Find the Inverse Laplace Transform of $X(S) = \frac{2S+1}{S+2}$	
		(i) For ROC Re(s) > -2	**[4M]**
		(ii) For ROC Re(s) < -2	**[4M]**
	B	State and prove initial and final value theorem in Laplace transform.	**[6M]**

OR

10	***A***	Find the Inverse Z Transform of x(z) where $x(z) = \frac{z}{z^2-5z+6}$	
		(i) For $\|z\| > 3$	**[4M]**
		(ii) For $\|z\| < 2$	**[4M]**
	B	State and prove time reversal and frequency differentiation properties of Z-transform.	**[6M]**

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