II B. Tech I Semester Regular Examinations, Feb/March - 2022
SIGNALS AND SYSTEMS
(Com to ECE, EIE, ECT)

Time: 3 hours   Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit
All Questions carry **Equal** Marks
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1 a) Prove the following: [7M]
     (i) The power of the energy signal is zero over infinite time.
     (ii) The energy of the power signal is infinite over infinite time.

   b) Define the error function while approximating signals and hence derive the [7M] expression for condition for orthogonality between two waveforms $f_1(t)$ and $f_2(t)$

Or

2 a) Define a system. How are the systems classified? Define each one of them. [7M]

   b) Test the Causality and Stability of the following system [7M]
     (i) $y(n) = x(n) - x(-n-1) + x(n-1)$ (ii) $y(t) = 5\, e^{-2t}\, u(t)$.

3 a) Derive the expression for Fourier Transform from Fourier Series. [7M]

   b) State and prove Differentiation and integration properties of Fourier Transform. [7M]
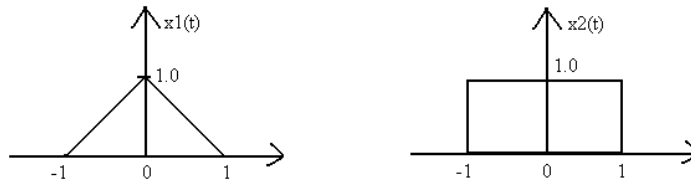
Or

4 a) State and prove Parseval's relation of Fourier Transform. [7M]

   b) Derive the relation between trigonometric and exponential Fourier series [7M] coefficients.

5 a) What is an LTI system? Explain its properties. Derive an expression for the [7M] transfer function of an LTI system.

   b) Explain the concept of Paley-Wiener criterion for physical realizability using [7M] relevant expressions.

Or

6 a) Explain the filter characteristics of ideal LPF, HPF and BPF using their magritude [7M] and phase responses.

   b) Obtain conditions for the distortion less transmission through a system. [7M]

7 a) Find the Cross correlation between triangular and gate function as shown in below. [7M]

   b) Derive the relationship between autocorrelation and energy spectral density of an [7M] energy signal.

Or

8 a) State and explain the sampling theorem for band pass signals. [7M]

   b) Explain the method of detection of periodic signals in the presence of noise by [7M] correlation.

9 a) Find the Laplace Transform of the following: (i) $te^{-at}u(t)$ and (ii) $Cos(\omega_0 t)\,u(t)$ [7M]

   b) What are the methods by which inverse z-transform can be found out? Explain any   [7M]
       one method.

<div align="center">Or</div>

10 a) State and prove time shifting and time convolution properties of z- transform.   [7M]

    b) Find out the Laplace transform of the signal shown in below figure.   [7M]

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