

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.

## SECTION-I

$1 \quad \boldsymbol{A}$ What are the types of representation of discrete time signals? Represent a sequence in all types.
B Write the properties of impulse signal.
OR
$2 \boldsymbol{A} \quad$ State and prove any two properties of the Fourier series.
B Find the relationship between exponential Fourier series coefficients and trigonometric Fourier series coefficients.

SECTION-II
3 A State and Prove Modulation theorem.
$\boldsymbol{B}$ Find the Fourier transform of
(i) $x(t)=e^{-a|t|}$
(ii) $x(t)=e^{-j \omega_{0} t} u(t)$

4 State and prove sampling theorem.
[14M]

## SECTION-III

5 A Obtain the relationship between the bandwidth and rise time of ideal low pass Filter
B Explain causality and physical reliability of a system and hence give Paley-
Wiener criterion.

OR
$6 \quad \boldsymbol{A} \quad$ What is an LTI system?. Derive an expression for the Transfer function of an LTI system.
B Obtain the conditions for the distortion less transmission through a system.

## SECTION-IV

$7 \quad \boldsymbol{A} \quad$ Derive Relation between Auto Correlation Function and Energy spectraldensity Function

B State the properties of cross-correlation.
$8 \quad \boldsymbol{A} \quad$ Compare energy spectral density (ESD) and power spectral density (PSD)
$\boldsymbol{B} \quad$ A signal $\mathrm{x}(\mathrm{t})=\mathrm{e}^{-2 \mathrm{t}} \mathrm{u}(\mathrm{t})$ is passed through an idle LPF with cut off frequency of one radian $/ \mathrm{sec}$.
(i) Test whether the input is an energy signal.
(ii) Find the input and Output Energy

## SECTION-V

$9 \quad \boldsymbol{A}$
Find the z-transform of $x(n)=\left(\frac{1}{2}\right)^{n} u(n)+\left(\frac{1}{3}\right)^{n} u(-n-1)$
B Define region of convergence and state the properties of ROC for Laplace transform.

OR
$10 \quad \boldsymbol{A}$ Find the Laplace transform of $x(t)=-e^{-a t} u(-t)+e^{a t} u(-t-1)$
$\boldsymbol{B}$ Define region of convergence and state the properties of ROC for Ztransform.
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