

Code No.: EC303PC

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CMR ENGINEERING COLLEGE: : HYDERABAD

UGC AUTONOMOUS

II-B.TECH-I-Semester End Examinations (Regular) - February- 2023

SIGNALS AND SYSTEMS

(ECE)

[Time: 3 Hours]

[Max. Marks: 70]

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 20 marks. Answer all questions in Part A.

Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A

(20 Marks)

1. a) State the properties of unit impulse function? [2M]
- b) Define signum function? [2M]
- c) Explain Hilbert transform of a signal? [2M]
- d) State the convolution property of a Fourier transform? [2M]
- e) Define the bandwidth of signal? [2M]
- f) Write the LPF, HPF, BPF, BRF filter characteristics of linear systems? [2M]
- g) Derive the Fourier transform of constant? [2M]
- h) Write any two properties Region of Convergence (ROC) in Z-transform? [2M]
- i) Write the relation between convolution and correlation? [2M]
- j) What is aliasing effect and how it is reduced? [2M]

PART-B

(50 Marks)

2. Define and derive the expression for evaluating the mean square error? [10M]
- OR**
3. What are the basic operations of signals? Illustrate with an example. [10M]
- 4.a) State and prove the any two properties of Fourier transform? [5M]
 - b) Find the Fourier transform of the signal $x(t) = t e^{-2t} u(t)$? [5M]
- OR**
5. Expand the function $f(t)$ by exponential Fourier series over the interval (0,1). In this interval $f(t)$ is expressed as $f(t) = At$. [10M]
- 6.a) Explain causality and physical reliability of a system and hence give Paley-Wiener criterion? [5M]
 - b) Derive the condition for distortion less transmission through the system? [5M]
- OR**
7. Derive the relation between rise time and bandwidth of a LTI system? [10M]

- 8.a) Find the inverse Laplace transform of the following. [5M]

$$X(s) = \frac{s + 1}{s^2 + 5s + 6}$$

- b) Find the inverse Z-transform of the following. [5M]

$$X(z) = \frac{3}{\left(z - \frac{1}{4}\right)\left(z - \frac{1}{3}\right)}$$

OR

9. a) Derive the relation between Laplace transform and Fourier transform of a signal? [5M]

- b) Determine the Z- transform of the following sequence and draw its ROC. [5M]

$$x[n] = 7\left(\frac{1}{3}\right)^n u[n] - 6\left(\frac{1}{2}\right)^n u[n]$$

10. State and prove any two properties of auto correlation and cross correlation function? [10M]

OR

11. Prove the sampling theorem of a band limited signal? [10M]
