

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY-GURUJADA VIZINAGARAM
II B. Tech I Semester Regular Examinations, November – 2024
SIGNALS AND SYSTEMS
(ECE)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part A, Part B.
Part A is compulsory, Answer all questions.
In Part B, Answer any one question from each unit.*

PART-A

(20 Marks)

- 1 a) What are the major classifications of the signal? [2]
- b) Define discrete time unit step & unit impulse. [2]
- c) How does circular convolution differ from linear convolution, and in what contexts is circular convolution preferred over linear convolution? [2]
- d) Explain the significance of the impulse response in an LTI system. How can it be used to determine the system's output for any arbitrary input signal? [2]
- e) What is the significance of the linearity property of the Fourier Transform? [2]
- f) Explain Parseval's theorem in the context of the Fourier Transform. [2]
- g) What is the purpose of the Laplace Transform in analyzing continuous-time systems? [2]
- h) Explain the Region of Convergence (ROC) for the Z-Transform. How does the ROC impact the stability and causality of discrete-time systems? [2]
- i) Explain the concept of the Nyquist rate. [2]
- j) How does oversampling affect the sampled signal? [2]

PART-B

(50 Marks)

Unit-1

- 2 a) Distinguish between Causal and Non-causal systems with an example. [5]
- b) What are the basic operations on signals? Illustrate with an example. [5]

(OR)

- 3 a) Explain the properties of unit impulse function. [5]
- b) What is meant by orthogonality and derive the condition under which two Signals $x_1(t)$ and $x_2(t)$ said to be orthogonal to each other. [5]

Unit-2

- 4 a) Discuss the concept of convolution in time domain and frequency domain. [5]
- b) What is Impulse Response? Show that the response of an LTI system is convolution integral of its impulse Response with input signal? [5]

(OR)

- 5 a) State and Prove Convolution property and Parseval's relation of Fourier series. [5]
b) Obtain the convolution of the following two signals: [5]

$$x(t) = e^{2t}u(t) \text{ and } h(t) = u(t - 3)$$

Unit-3

- 6 a) State the time scaling and Duality properties of Fourier transform [5]
b) What is the difference between Fourier series Analysis and Fourier Transforms? [5]
Explain with an example.

(OR)

- 7 a) What is the significance of Hilbert transform? List out any three properties of [5]
Hilbert transform.
b) Derive the expression for transfer function of a LTI system. [5]

Unit-4

- 8 a) State and prove the time differentiation property in Laplace transform [5]
b) State and prove the final value theorem in z-transform. [5]

(OR)

- 9 a) Determine the initial and final values of $X(S) = \frac{2s+3}{s^2+5s+6}$ [5]
b) State and prove scaling in z-domain property of z-transform. [5]

Unit-5

- 10 a) Explain about the graphical and analytical proof for Band Limited Signals. [5]
b) Write a note on signal bandwidth and system band width. [5]

(OR)

- 11 a) State and prove sampling theorem for low pass band limited signal and explain [5]
the process of reconstruction of the signal from its samples.
b) What is the effect of under sampling? Discuss different types of samplings. [5]
