

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
IV B. Tech I Semester Advanced Supplementary Examinations March 2025

BASICS OF SIGNALS AND SYSTEMS

(Open Elective)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from Each unit
 All Questions Carry Equal Marks

UNIT-I

1. a) What are the basic operations of signals? Illustrate with an example. [7M]
 b) Sketch the following signals: where $r(t)$ is a unit ramp signal. (i) $x(t) = r(-t+2)$ [7M]
 (ii) $x(t) = -2r(t)$ (iii) $x(t) = r(2t-4)$.

(OR)

2. a) Identify whether the following systems are: (i) Static or dynamic. (ii) Linear or non-linear. (iii) Causal or non-causal. (iv) Time invariant or time variant. [7M]
 (v) Stable or not stable. The given system is $y(n) = a^n u(n)$.
 b) Determine whether the following systems are time invariant or not. Check whether the systems are causal or not. $y(t) = t x(t)$; $y(n) = x(2n)$. [7M]

UNIT-II

3. a) Define Impulse Response? Show that the response of an LTI system is convolution integral of its impulse response with input signal. [10M]
 b) Compute and plot the convolution $y(t)$ of the given signals: [4M]
 $x(t) = u(t-3) - u(t-5)$, $h(t) = e^{(-3t)} u(t)$

(OR)

4. a) Explain how convolution can be implemented using block diagram representations. Provide a step-by-step guide to constructing a block diagram for an LTI system. [7M]
 b) Compare the differential and difference equation representations of LTI systems. [7M]

UNIT-III

5. a) What is the Discrete-Time Fourier Transform (DTFT), and how does it relate to the Discrete-Time Fourier Series (DTFS). [7M]
 b) Explain the Continuous-Time Fourier Transform (CTFT) and its properties. [7M]

(OR)

6. a) Discuss the Fourier transform of the following functions. i) Impulse function ii) DC signal iii) Unit step function. [7M]
 b) Explain the concept of duality between time and frequency domains in the context of Fourier series and Fourier transforms. [7M]

UNIT-IV

7. a) Discuss how the frequency response of an LTI system is derived using the Fourier transform. [7M]
 b) How does the magnitude and phase response of an LTI system influence its behavior in the frequency domain. [7M]

(OR)

8. a) Provide an example of an LTI system where Fourier transform simplifies the analysis. [7M]
b) How does the Fourier transform represent periodic signals differently from the Fourier series? [7M]

UNIT-V

9. a) Explain the properties of Laplace transform. [7M]
b) Determine the inverse Laplace of the following functions. [7M]
i) $\frac{1}{s(s+1)(s+3)}$ ii) $\frac{3s^2 + 8s + 6}{(s+8)(s^2 + 6s + 1)}$

(OR)

10. a) Examine the following properties of Z transform i) Time shifting [7M]
ii) Correlation iii) Convolution
b) Find the Z-transform of the given signal $x(n)$ and find [7M]
ROC: $x(n) = [\sin(w_0 n)] u(n)$.
