



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

Approved by AICTE, New Delhi, Affiliated to Anna University, Chennai

Accredited by NAAC-UGC with 'A++' Grade (Cycle III) &

Accredited by NBA (B.E - CSE, EEE, ECE, Mech & B.Tech.IT)

COIMBATORE-641 035, TAMIL NADU



UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS

Linear time invariant system- System transfer function –Linear system with random inputs –Auto correlation and Cross correlation functions of input and output.

Linear Time-Invariant (LTI) Systems

Puzzle 1:

You have two identical ovens. If you put a cake in either oven for the same amount of time at the same temperature, the result is always the same, no matter what time of day you start. What properties of a system does this example illustrate?

Puzzle 2:

A music player increases the volume of any song by the same amount, regardless of the song or when you play it. What does this tell you about the system's linearity and time invariance?

System Transfer Function

Puzzle 3:

An audio engineer wants to know how a particular speaker changes the sound that passes through it. She plays a variety of sounds and records what comes out. What is she trying to find out about the speaker?

Puzzle 4:

Imagine a water filter that changes the taste of water in a consistent way, regardless of when you pour the water in. What kind of system characteristic is the filter demonstrating?

Linear System with Random Inputs



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Puzzle 5:

A weather station receives random temperature readings every hour and passes them through a computer program that always processes them in the same way. If you know how the program works, what can you say about the output readings?

Puzzle 6:

A radio receives random signals from different stations and passes them through a fixed amplifier. If the amplifier always behaves the same way, how does this help you predict the output signal?

Auto Correlation and Cross Correlation of Input and Output

Puzzle 7:

You notice that when the input to a machine has repeating patterns, the output also shows similar repeating patterns, but possibly with some delay or change in strength. What does this suggest about the relationship between the input and output?

Puzzle 8:

Two sensors measure vibrations on different parts of a bridge. Their readings are processed by the same type of electronic filter. If the sensors pick up similar vibrations at the same time, what can you say about the similarity of their outputs after filtering?

These puzzles use real-life scenarios to help you think about LTI systems, transfer functions, and how randomness in inputs affects outputs, all without requiring any equations or mathematical formulas^{[1][2][3][4]}.

1. https://en.wikipedia.org/wiki/Linear_time-invariant_system

2. <https://brilliant.org/wiki/linear-time-invariant-systems/>



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3. <https://sassafra13.github.io/LTIsystems/>

4. education.statistics