1. What is the fundamental property of Linear Time-Invariant (LTI) systems?
a) They exhibit exponential growth
b) They display time-varying behavior
c) Their response is proportional to the input and independent of time
d) They have a non-linear relationship between input and output

Answer: c) Their response is proportional to the input and independent of time
Explanation: LTI systems satisfy the properties of linearity and time-invariance, meaning their response is directly proportional to the input and remains constant over time.

2. Which representation is used to describe the output of an LTI system in terms of its impulse response?
a) Step response
b) Frequency response
c) Convolution integral
d) Impulse response

Answer: c) Convolution integral
Explanation: The output of an LTI system can be obtained by convolving the input signal with the impulse response of the system.

3. What is the significance of the impulse response in describing LTI systems?
a) It represents the response of the system to a unit impulse input
b) It represents the frequency content of the system
c) It determines the stability of the system
d) It represents the time-varying behavior of the system

Answer: a) It represents the response of the system to a unit impulse input
Explanation: The impulse response of an LTI system describes how the system responds to a unit impulse input, which in turn characterizes its behavior for any input signal through convolution.

4. Which of the following equations represents the relationship between input, output, and impulse response of an LTI system?
a) Fourier transform
b) Laplace transform
c) Difference equation
d) Convolution integral

Answer: d) Convolution integral
Explanation: The convolution integral expresses the output of an LTI system as the convolution of the input signal with the impulse response of the system.

5. Which form of representation is used to describe LTI systems by recursive equations involving current and past inputs and outputs?
a) Direct form-I
b) Direct form-II
c) Transpose
d) Cascade

Answer: b) Direct form-II
Explanation: Direct form-II representation of LTI systems involves recursive equations relating current and past inputs and outputs, allowing for efficient implementation.

6. What property ensures that the impulse response of an LTI system remains bounded for bounded inputs?
a) Linearity
b) Time-invariance
c) Causality
d) Stability

Answer: d) Stability
Explanation: Stability ensures that the impulse response of an LTI system remains bounded for bounded inputs, indicating that the system's response does not grow uncontrollably over time.

7. Which block diagram representation involves the series connection of multiple LTI systems?
a) Direct form-I
b) Direct form-II
c) Cascade
d) Parallel

Answer: c) Cascade
Explanation: Cascade representation involves connecting multiple LTI systems in series, where the output of one system serves as the input to the next.

8. In which block diagram representation are multiple LTI systems connected in parallel, each processing the same input?
a) Direct form-I
b) Direct form-II

c) Cascade
d) Parallel

Answer: d) Parallel
Explanation: In the parallel representation, multiple LTI systems are connected in parallel, each processing the same input independently.

9. Which property ensures that the output of an LTI system depends only on past and present inputs, not future inputs?
a) Linearity
b) Time-invariance
c) Causality
d) Stability

Answer: c) Causality
Explanation: Causality ensures that the output of an LTI system depends only on past and present inputs, not on future inputs, which is a fundamental property for many practical systems.

10. What type of system is characterized by having an impulse response that can be represented as a finite sequence of values?
a) Continuous-time LTI system
b) Discrete-time LTI system
c) Time-varying system
d) Non-linear system

Answer: b) Discrete-time LTI system

Explanation: Discrete-time LTI systems have impulse responses that can be represented as finite sequences of values, making them suitable for digital signal processing applications.

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