1. Which of the following best describes the purpose of Fourier analysis in the context of discrete time signals?

a) To analyze continuous time signals
b) To convert discrete time signals into continuous time signals
c) To represent discrete time signals in terms of sinusoidal components
d) To filter out noise from discrete time signals

Answer: c) To represent discrete time signals in terms of sinusoidal components

Explanation: Fourier analysis in the context of discrete time signals aims to decompose a signal into its constituent sinusoidal components, providing insights into its frequency content.

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2. What is the primary application of discrete time Fourier series (DTFS)?

a) Representation of continuous time signals
b) Representation of periodic discrete time signals
c) Representation of aperiodic discrete time signals
d) Representation of random signals

Answer: b) Representation of periodic discrete time signals

Explanation: DTFS is primarily used to represent periodic discrete time signals in terms of a sum of sinusoidal components.

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3. Which of the following statements regarding the Fourier transform of aperiodic signals is true?

a) Aperiodic signals cannot be represented using Fourier transform
b) Fourier transform of aperiodic signals results in a periodic spectrum
c) Fourier transform of aperiodic signals results in a continuous spectrum
d) Fourier transform of aperiodic signals is always real-valued

Answer: c) Fourier transform of aperiodic signals results in a continuous spectrum

Explanation: The Fourier transform of aperiodic signals results in a continuous spectrum, unlike the discrete spectrum obtained for periodic signals.

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4. What property of Fourier transform ensures that the signal can be reconstructed from its frequency domain representation?

a) Linearity
b) Time shifting
c) Convolution
d) Inverse transform

Answer: d) Inverse transform

Explanation: The inverse Fourier transform allows for the reconstruction of a signal from its frequency domain representation.

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5. Which property of Fourier transform ensures that the transform of a signal remains unchanged when the signal is delayed in time?

a) Linearity
b) Time shifting
c) Convolution
d) Differentiation

Answer: b) Time shifting

Explanation: Time shifting property of Fourier transform states that a time delay in the signal corresponds to a phase shift in the frequency domain.

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6. What is the condition for the convergence of the Discrete Time Fourier Transform (DTFT)?

a) The signal must be periodic
b) The signal must be aperiodic
c) The signal must be finite in duration
d) The signal must have finite energy

Answer: d) The signal must have finite energy

Explanation: The DTFT converges if the signal has finite energy, which means its sum of squares is finite.

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7. Which type of signals can be represented using Fourier Transform for periodic signals?

a) Periodic signals only
b) Aperiodic signals only
c) Both periodic and aperiodic signals
d) Random signals

Answer: c) Both periodic and aperiodic signals

Explanation: Fourier Transform for periodic signals can be applied to both periodic and aperiodic signals.

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8. What property of DTFT makes it useful in signal processing applications such as filtering?

a) Time shifting
b) Frequency shifting
c) Convolution

d) Linearity

Answer: c) Convolution

Explanation: Convolution property of DTFT is useful in signal processing applications such as filtering, where the convolution theorem allows for efficient implementation of filtering operations in the frequency domain.

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9. In which domain is a signal represented for the application of Fourier Transform?

a) Time domain
b) Frequency domain
c) Both time and frequency domain
d) Amplitude domain

Answer: a) Time domain

Explanation: Fourier Transform is applied to signals in the time domain to obtain their frequency domain representation.

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10. What is the significance of the linearity property of Fourier Transform?

a) It allows for the analysis of non-linear signals
b) It simplifies the convolution operation in the frequency domain
c) It ensures that the transform of a sum of signals is the sum of their individual transforms
d) It enables time-domain shifting of signals

Answer: c) It ensures that the transform of a sum of signals is the sum of their individual transforms

Explanation: Linearity property of Fourier Transform states that the transform of a sum of signals is the sum of their individual transforms, making it a fundamental property in signal analysis and processing.

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