1. What is the primary difference between the Discrete Fourier Transform (DFT) and the Discrete Fourier Series (DFS)?

a) DFT operates on discrete-time signals, while DFS operates on continuous-time signals.
b) DFT is defined for periodic signals, while DFS is defined for aperiodic signals.
c) DFT yields a finite sequence of frequency components, while DFS yields an infinite series of frequency components.
d) DFT operates on finite-duration signals, while DFS operates on infinite-duration signals.

Answer: d) DFT operates on finite-duration signals, while DFS operates on infinite-duration signals.
Explanation: DFT is used for finite-duration signals, providing a finite sequence of frequency components, whereas DFS is applied to infinite-duration signals, yielding an infinite series of frequency components.

2. Which property of the Discrete Fourier Transform (DFT) allows for efficient computation using the Fast Fourier Transform (FFT) algorithm?

a) Linearity
b) Time-shift
c) Periodicity
d) Symmetry

Answer: c) Periodicity
Explanation: The periodicity property of the DFT allows for the efficient computation of the FFT algorithm, reducing the computational complexity from O(N^2) to O(N log N), where N is the number of samples.

3. What is the consequence of zero-padding a signal before computing its Discrete Fourier Transform (DFT)?

a) Increased frequency resolution
b) Decreased frequency resolution
c) Improved time-domain representation
d) Reduced computational complexity

Answer: a) Increased frequency resolution
Explanation: Zero-padding a signal before computing its DFT increases the number of samples, resulting in finer frequency resolution in the frequency domain.

4. Which property of the Discrete Fourier Transform (DFT) makes it useful for circular convolution in signal processing?

a) Linearity
b) Periodicity
c) Time-shift
d) Symmetry

Answer: b) Periodicity
Explanation: The periodicity property of the DFT allows for efficient implementation of circular convolution, where the signals are assumed to be periodic and convolved accordingly.

5. In the context of Discrete Fourier Transform (DFT), what does the Nyquist frequency represent?

a) The maximum frequency that can be represented without aliasing

b) The minimum frequency that can be represented without aliasing
c) The frequency at which the signal is sampled
d) The half of the sampling frequency

Answer: d) The half of the sampling frequency
Explanation: The Nyquist frequency is half the sampling frequency and represents the maximum frequency that can be represented without aliasing in the sampled signal.

6. Which property of the Discrete Fourier Transform (DFT) states that convolution in the time domain corresponds to multiplication in the frequency domain?

a) Linearity
b) Convolution
c) Periodicity
d) Multiplication

Answer: b) Convolution
Explanation: The convolution property of the DFT states that convolution in the time domain corresponds to multiplication in the frequency domain, simplifying signal processing tasks such as filtering.

7. What effect does zero-padding have on the computational complexity of computing the Discrete Fourier Transform (DFT) using the FFT algorithm?

a) Decreases computational complexity
b) Increases computational complexity
c) Has no effect on computational complexity
d) Reduces memory usage

Answer: c) Has no effect on computational complexity
Explanation: Zero-padding does not affect the computational complexity of the FFT algorithm; it only increases frequency resolution without altering the computational complexity.

8. Which property of the Discrete Fourier Transform (DFT) allows for efficient implementation of the inverse DFT?

a) Linearity
b) Convolution
c) Symmetry
d) Periodicity

Answer: d) Periodicity
Explanation: The periodicity property of the DFT enables the efficient implementation of the inverse DFT, allowing for the reconstruction of the original time-domain signal from its frequency-domain representation.

9. What is the main limitation of using the Discrete Fourier Transform (DFT) for analyzing non-periodic signals?

a) Limited frequency resolution
b) Limited time resolution
c) Difficulty in computation
d) Aliasing

Answer: a) Limited frequency resolution
Explanation: The DFT assumes periodicity, making it less suitable for analyzing non-periodic

signals and resulting in limited frequency resolution for such signals.

10. Which property of the Discrete Fourier Transform (DFT) allows for efficient implementation of convolution in the frequency domain?

a) Convolution
b) Linearity
c) Periodicity
d) Multiplication

Answer: d) Multiplication
Explanation: The multiplication property of the DFT allows convolution in the time domain to be efficiently implemented as multiplication in the frequency domain, facilitating various signal processing operations.

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