1. What is the primary reason complex exponentials are used in the decomposition of signals for L
A) They are easy to compute.
B) They are eigenfunctions of LTI systems.
C) They have real-valued coefficients.
D) They minimize energy loss.
Answer: B) They are eigenfunctions of LTI systems.**
---

2. For a discrete-time periodic signal with period \(N \), how many distinct complex exponentials ar
A) \(N \)
B) \(2N \)
C) \(N/2 \)
D) \(\infty \)
Answer: A) \(N \)**
---

3. What is the period of the Fourier series coefficients in the discrete-time Fourier series (DTFS)? (I
A) Same as the signal's period \(N \)
B) Twice the signal's period
C) Half the signal's period
D) Non-periodic
Answer: A) Same as the signal's period \(N \)**
---

4. As the period \(N \) of a discrete-time signal increases, what happens to the spacing between the
A) Spacing increases
B) Spacing decreases
C) Spacing remains constant
D) Spacing becomes random
Answer: B) Spacing decreases**
---

5. Which of the following is a key difference between the discrete-time Fourier transform (DTFT) an
A) DTFT is aperiodic in frequency.
B) CTFT is always periodic.
C) DTFT is periodic in frequency.
D) CTFT uses summation instead of integration.
Answer: C) DTFT is periodic in frequency.**
---

6. What is the relationship between the Fourier series coefficients of a periodic signal and the Four
A) Coefficients are scaled samples of the Fourier transform.
B) Coefficients are the integral of the Fourier transform.
C) They are identical.
D) There is no relationship.
Answer: A) Coefficients are scaled samples of the Fourier transform.**
---

7. When the period \(N \) of a discrete-time periodic signal approaches infinity, what does the Four
A) Discrete-Time Fourier Series (DTFS)
B) Discrete-Time Fourier Transform (DTFT)
C) Continuous-Time Fourier Transform (CTFT)
D) Z-Transform
****Answer:** B) Discrete-Time Fourier Transform (DTFT)**
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8. In the context of DTFS, why are there only \(N \) distinct coefficients? (Medium)**
A) Because complex exponentials repeat every \(N \) samples.
B) Due to energy conservation.
C) To simplify computation.
D) Because signals are band-limited.
****Answer:** A) Because complex exponentials repeat every \(N \) samples.**
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9. Which mathematical operation is used in the analysis equation of the Discrete-Time Fourier Tran
A) Integration
B) Differentiation
C) Summation
D) Convolution
****Answer:** C) Summation**
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10. What is the fundamental frequency interval over which the Discrete-Time Fourier Transform (DT
A) \(0 \) to \(\infty \)
B) \(-\infty \) to \(\infty \)
C) \(0 \) to \(2\pi \)
D) \(-\pi \) to \(\pi \)
****Answer:** D) \(-\pi \) to \(\pi \)**