1. What is the primary decomposition method for representing discrete-time periodic signals? (Eas
A) Laplace transform
B) Discrete-Time Fourier Series (DTFS)
C) Z-transform
D) Hilbert transform
****Answer:** B) Discrete-Time Fourier Series (DTFS)**
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2. How many distinct complex exponentials are available to represent a periodic sequence with per
A) $2N$
B) $N/2$
C) N
D) ∞
****Answer:** C) N**
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3. What happens to the spacing of Fourier series coefficients as the period *N* of a signal increase
A) Spacing becomes coarser
B) Spacing remains constant
C) Spacing becomes finer
D) Spacing becomes random
****Answer:** C) Spacing becomes finer**
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4. Which property distinguishes the discrete-time Fourier transform (DTFT) from the continuous-tir
A) DTFT is aperiodic in frequency
B) DTFT is periodic in frequency
C) DTFT uses integrals for synthesis
D) DTFT cannot represent aperiodic signals
****Answer:** B) DTFT is periodic in frequency**
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5. How are the Fourier series coefficients of a periodic signal related to the Fourier transform of on
A) Coefficients are identical to the Fourier transform
B) Coefficients are $1/N$ times samples of the Fourier transform
C) Coefficients are the derivative of the Fourier transform
D) Coefficients are unrelated to the Fourier transform
****Answer:** B) Coefficients are $1/N$ times samples of the Fourier transform**
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6. What is the fundamental frequency ω_0 for a discrete-time periodic signal with period *N
A) $\omega_0 = \pi/N$
B) $\omega_0 = 2\pi/N$
C) $\omega_0 = N/2\pi$
D) $\omega_0 = 1/N$
****Answer:** B) $\omega_0 = 2\pi/N$**
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7. Which equation represents the synthesis step of the Discrete-Time Fourier Series (DTFS)? (Medi
A) $x[n] = \sum_{k=0}^{N-1} a_k e^{jk\omega_0 n}$
B) $a_k = \frac{1}{N} \sum_{n=0}^{N-1} x[n] e^{-jk\omega_0 n}$
C) $X(\omega) = \sum_{n=-\infty}^{\infty} x[n] e^{-j\omega n}$
D) $x[n] = \frac{1}{2\pi} \int_{-\pi}^{\pi} X(\omega) e^{j\omega n} d\omega$
****Answer:** A) $x[n] = \sum_{k=0}^{N-1} a_k e^{jk\omega_0 n}$**
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8. What is the analysis equation for the Discrete-Time Fourier Transform (DTFT)? (Hard)**
A) $X(\omega) = \sum_{n=-\infty}^{\infty} x[n] e^{-j\omega n}$
B) $x[n] = \frac{1}{2\pi} \int_{-\pi}^{\pi} X(\omega) e^{j\omega n} d\omega$
C) $a_k = \frac{1}{N} \sum_{n=0}^{N-1} x[n] e^{-jk\omega_0 n}$
D) $X(\omega) = \frac{1}{1 - ae^{-j\omega}}$
****Answer:** A) $X(\omega) = \sum_{n=-\infty}^{\infty} x[n] e^{-j\omega n}$**
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9. How are the Fourier series coefficients of a periodic sequence with period *N* typically interprete
A) As a finite sequence of length N
B) As an aperiodic sequence
C) As a periodic sequence with period N
D) As a random sequence
****Answer:** C) As a periodic sequence with period N**
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10. What is the effect of an LTI system on a complex exponential input signal? (Easy)**
A) Time shift
B) Amplitude scaling and phase shift
C) Differentiation
D) Frequency modulation
****Answer:** B) Amplitude scaling and phase shift**
