Assignment 12

Due on 2020-04-22, 23:59 EST.

1. Which of the following filters is best suited to implement a discrete-time signal $x(n)$ with finite number of samples?
   - [ ] Finite Impulse Response (FIR)
   - [ ] Infinite Impulse Response (IIR)

2. The DTFT $X(e^{j\omega})$ of the finite length sequence $x[n] = A \cos(\omega_0 n + \phi)$, $0 \leq n < N$, $-\pi < \omega < \pi$, is given as:
   - [ ] $X(e^{j\omega}) = A \left( \frac{1}{2} \left( 1 + e^{j2\omega_0} \right) \right)$
   - [ ] $X(e^{j\omega}) = A \left( \frac{1}{2} \left( 1 + e^{j2\omega_0} \cos(\phi) \right) \right)$

3. The DTFT $X(e^{j\omega})$ of the finite length sequence $x[n] = A \cos(\omega_0 n)$, $0 \leq n < N$, $-\pi < \omega < \pi$, is given as:
   - [ ] $X(e^{j\omega}) = A \left( \frac{1}{2} \left( 1 + e^{j2\omega_0} \right) \right)
   - [ ] $X(e^{j\omega}) = A \left( \frac{1}{2} \left( 1 + e^{j2\omega_0} \cos(\phi) \right) \right)$

4. The DFT coefficients $X(k)$ of the finite length sequence $x[n] = A \cos(\omega_0 n + \phi)$, $0 \leq n < N$, $-\pi < \omega < \pi$, are defined as:
   - $X(k) = \sum_{n=0}^{N-1} x[n] e^{-j2\pi kn/N}$

5. Consider the filter with impulse response $h[n] = e^{-2n} u[n]$. The periodic signal $x[n] = \sin(\pi n)$ is passed through the filter. The resulting signal is:
   - $y[n] = e^{-2n} \sin(\pi n)$
   - $y[n] = e^{-2n} \sin(\pi n) + n e^{-2n} u[n]$