ECEn 487 - Introduction to Digital Signal Processing

Winter 2013

Quiz 5

1. I have the following pole-zero diagrams for four different filters.

   ![Pole-Zero Diagrams](image)

   I) (1 pt) Which filters are stable?
      \[ B, C, D \]

   II) (1 pt) Which filters are FIR?
      \[ C \]

   III) (1 pt) Which filters are minimum-phase?
      \[ D \]

   IV) (1 pt) Which filters are generalized linear-phase?
      \[ C \]

   V) (2 pts) Indicate for each filter if it is all-pass, low-pass, high-pass, or band-pass.
      a) \textit{All-pass}
      b) \textit{Band-pass}
      c) \textit{High-pass}
      d) \textit{Low-pass}

2. (2 pts) Suppose you have a sequence \( \tilde{x}[n] \), which is periodic with a period of \( N = 10 \). What is the resulting sequence \( \tilde{x}[n-10] + \tilde{x}[n+20] \)?

   \[ 2 \tilde{x}[n] \]

3. (2 pts) Suppose I have sequences \( \tilde{x}[n] \) and \( \tilde{y}[n] \) that are periodic with a period of 7. If I find the discrete Fourier Series for each of these, \( \tilde{X}[k] \) and \( \tilde{Y}[k] \), respectively, then what is the resulting sequence, \( \tilde{z}[n] \), if \( \tilde{Z}[k] = 2\tilde{X}[k] - 3\tilde{Y}[k] \).

   \[ \tilde{z}[n] = 2\tilde{x}[n] - 3\tilde{y}[n] \]