1. What is a key characteristic that distinguishes IIR filters from FIR filters?
a) IIR filters have linear phase response
b) FIR filters are always stable
c) IIR filters have feedback
d) FIR filters are implemented using feedback loops

Answer: c) IIR filters have feedback
Explanation: In IIR (Infinite Impulse Response) filters, the output of the filter is fed back into the system, which introduces feedback loops. This characteristic allows IIR filters to achieve similar frequency response as analog filters with fewer parameters.

2. Which technique is commonly used for designing IIR filters that maintains the frequency response of analog filters?
a) Impulse invariant transformation
b) Fourier transformation
c) Rectangular windowing
d) Bilinear transformation

Answer: d) Bilinear transformation
Explanation: The bilinear transformation is often used to convert analog filter designs into digital filters while preserving the frequency response characteristics of the analog filter.

3. What is the primary drawback of using the impulse invariant transformation for designing digital filters?
a) It introduces instability in the filter
b) It results in non-linear phase response
c) It requires extensive computational resources

d) It causes aliasing in the frequency domain

Answer: b) It results in non-linear phase response
Explanation: Impulse invariant transformation can introduce non-linear phase response in the designed digital filter, which may not be suitable for certain applications where linear phase response is desired.

4. Which windowing technique is commonly used in FIR filter design to attenuate the side lobes of the frequency response?
a) Rectangular window
b) Hanning window
c) Impulse invariant window
d) Bilinear window

Answer: b) Hanning window
Explanation: The Hanning window is frequently used in FIR filter design to reduce the amplitude of the side lobes in the frequency response, improving the filter's performance.

5. Which of the following is an advantage of using FIR filters over IIR filters?
a) FIR filters have linear phase response
b) FIR filters require fewer coefficients
c) FIR filters can be easily implemented with feedback loops
d) FIR filters are more computationally efficient

Answer: a) FIR filters have linear phase response
Explanation: FIR filters inherently have a linear phase response, which means all frequency components of the input signal are delayed by the same amount, preserving the shape of the

input signal waveform.

6. What is the purpose of using windowing techniques in FIR filter design?
a) To reduce the order of the filter
b) To minimize the passband ripple
c) To adjust the cutoff frequency
d) To improve the frequency response and reduce side lobes

Answer: d) To improve the frequency response and reduce side lobes
Explanation: Windowing techniques are applied to the impulse response of FIR filters to shape the frequency response and reduce undesired side lobes.

7. Which windowing technique results in a trade-off between main lobe width and side lobe level?
a) Rectangular window
b) Hanning window
c) Blackman window
d) Kaiser window

Answer: c) Blackman window
Explanation: The Blackman window is known for its ability to provide a trade-off between the width of the main lobe and the level of the side lobes in the frequency response.

8. In FIR filter design, what effect does increasing the length of the filter have on its frequency response?
a) Increases the passband ripple
b) Widens the main lobe

c) Reduces the computational complexity
d) Decreases the stopband attenuation

Answer: b) Widens the main lobe
Explanation: Increasing the length of an FIR filter generally widens the main lobe in the frequency response, resulting in a narrower transition band and improved frequency selectivity.

9. Which windowing technique is primarily used for designing FIR filters with a very specific frequency response shape?
a) Rectangular window
b) Hamming window
c) Kaiser window
d) Bartlett window

Answer: c) Kaiser window
Explanation: The Kaiser window is often chosen when designing FIR filters with specific frequency response requirements, as it allows precise control over the transition width and stopband attenuation.

10. Which transformation technique is preferred when designing digital filters to maintain stability and preserve the frequency response of analog filters?
a) Fourier transformation
b) Impulse invariant transformation
c) Bilinear transformation
d) Laplace transformation

Answer: c) Bilinear transformation

Explanation: The bilinear transformation is commonly used in digital filter design to convert analog filters to digital form while preserving stability and the frequency response characteristics of the analog filter.

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