Quiz Number: 3	Course Title: Digital Signal and Image Processing	Course Code: ELEC 421	Date: Thursday, November 21, 2024	Duration of Quiz: 15 minutes	Number of Questions: 5	Instructor: Siamak Najarian, Ph.D., P.Eng.	University: UBC	Department: Electrical and Computer Engineering

Please carefully read the following instructions and guidelines:

1. *This quiz is closed books/notes.*
2. *You will not get a negative mark for choosing the incorrect answer.*
3. *Each question carries 1 mark.*

Best of Luck!

Question 1:

In digital signal processing, a bandlimited signal with a maximum frequency ω_B can be perfectly reconstructed from its samples if the sampling frequency ω_S satisfies which of the following conditions?

A. $\omega_S < 2\omega_B$

B. $\omega_S = 2\omega_B$

C. $\omega_S \geq 2\omega_B$

D. $\omega_S > 2\omega_B$

Question 2:

To mitigate the aliasing effect in signal sampling, what technique can be used to prevent high-frequency components from distorting the sampled signal?
A. Apply a highpass filter to remove low-frequency components before sampling, ensuring the signal conforms to the Nyquist Rate (NR).
B. Apply a bandpass filter to ensure the signal remains within a specific frequency range.
C. Apply a lowpass filter to the signal before sampling to remove high-frequency components, ensuring the signal conforms to the Nyquist Rate (NR).
D. Apply a frequency modulation technique to shift the signal frequencies before sampling.

Question 3:

In the context of zero-order hold reconstruction, which two functions should be convolved with each other to generate the reconstructed signal?

A. The original continuous signal and a unit impulse function

B. The discrete-time delta functions and a rectangular pulse function

C. The sampled signal and a triangular pulse function

D. The discrete-time delta functions and a Gaussian pulse function

Question 4:

In digital signal processing, one key difference between IIR and FIR low-pass filters is related to the filter's impulse response and phase characteristics. Which of the following statements is true about IIR low-pass filters?

A. IIR filters have a finite impulse response and typically exhibit linear phase characteristics.

B. IIR filters have an infinite impulse response and can achieve a steeper roll-off with fewer coefficients than FIR filters.

C. IIR filters require more coefficients than FIR filters to achieve the same roll-off.

D. IIR filters are always stable and have a linear phase response.

Question 5:

Which of the following is true regarding a Finite Impulse Response (FIR) low-pass filter in Digital Signal Processing (DSP)?

A. FIR filters have a finite impulse response, are always stable, have a linear phase response, and require more coefficients for similar performance compared to IIR filters.

B. FIR filters always have a non-linear phase response, which distorts the order of frequencies in the signal.

C. FIR filters are always unstable, but they are easier to design for specific phase requirements.

D. FIR filters can achieve a steeper roll-off for a given filter order compared to IIR filters, but they are less computationally efficient.

End of Questions

Answer Sheet:

Question Number	A	B	C	D
1				■
2			■	
3		■		
4		■		
5	■			