

University of Nebraska-Lincoln

Digital Signal Processing: Quiz 7

December 3, 2025

Name: _____

Total Points: 10

In digital signal processing, upsampling (interpolation) is an operation used to increase the sampling rate of a discrete-time signal by an integer factor L . This operation involves inserting $L - 1$ zero-valued samples between consecutive samples of the original sampled signal, followed by low-pass filtering to remove spectral copies (or images).

1. **(10 points)** Discuss the advantages of upsampling in digital signal processing applications. Your response should address the following:
 - (a) **(6 points)** Describe a practical application or scenario where upsampling is beneficial, explaining the specific advantage gained.
 - (b) **(2 points)** Explain how upsampling affects the frequency domain representation of a signal.
 - (c) **(2 points)** Identify one potential challenge or consideration that must be addressed when implementing upsampling in a real-world system.