

DSP Fall 2020

Quiz #1

Name:

Consider the following system below, with input $X_c(j\Omega)$, and the frequency response of $H(e^{j\omega})$ are as shown. $X_c(t)$ is sampled at exactly Nyquist ($2\pi/T = 2\Omega_n$) and that the D/C converter is running at rate $\frac{T}{2}$.

- (8 points) Sketch $X(e^{j\omega})$, $X_e(e^{j\omega})$, $Y(e^{j\omega})$, and $Y_c(j\Omega)$. Label all frequencies and amplitudes.
- (1 point) Can you find an equivalent continuous time LTI system? If so, specify the system. If not, explain why not.
- (1 point) Can you use a polyphase implementation to reduce the amount of computation used to perform the upsampling and filtering operations? If no, explain why not. If yes, sketch a block diagram showing an equivalent system implemented using a polyphase filter decomposition.

