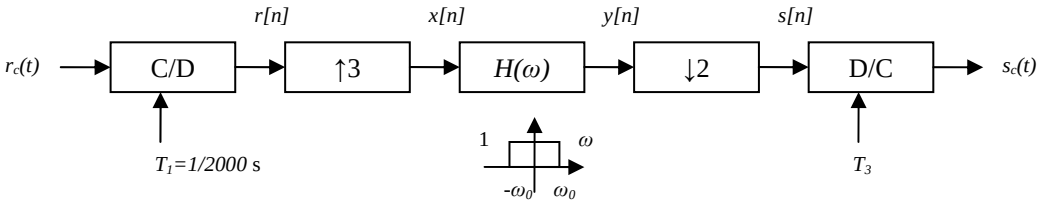
University of California, Berkeley
Department of Electrical Engineering and Computer Sciences
EE123: DIGITAL SIGNAL PROCESSING

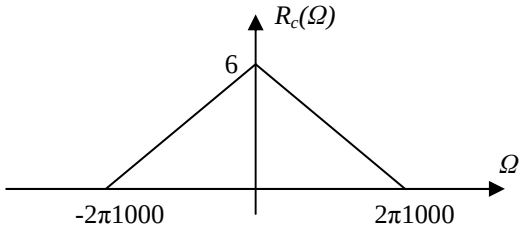
Fall 2006

Discussion #12

1. Consider the following system:



Assume that $R_c(\Omega)$ is band-limited as shown below.



(a) Sketch $R(\omega)$ and $X(\omega)$.
(b) Choose nonzero values for ω_0 and T_2 such that $y[n]=\alpha r_c(nT_2)$ for some non-zero α.
(c) Using the value of ω_0 found in (b), determine a choice for T_3 such that $s_c(t)=\beta r_c(t)$ for some nonzero β.

2. Location of zeros for Type I/II/III/IV FIR Linear-Phase Filters

3. Consider the each of the following filters and determine whether it is a generalized linear-phase filter, i.e. $H(\omega)=A(\omega)e^{-j\alpha\omega+j\beta}$ with $A(\omega)$, α and β real. If so, determine $A(\omega)$, α and β. In addition, if you determine that it is a generalized linear-phase filter, indicate whether it also meets the more stringent criterion of being a linear-phase filter, i.e. $H(\omega)=|H(\omega)|e^{-j\alpha\omega}$.