

ECE-486 Spring 2008, April 25 Quiz

Name : _____

The transfer function of a continuous-time, first order “all-pass” filter is given by

$$H_c(s) = \frac{s - a}{s + a}$$

where a is real and $a \geq 0$. One can verify that $|H_c(j\Omega)| = 1$ for all Ω . The filter provides a frequency dependent phase shift, taking a value of $\pi/2$ radians at $\Omega = a$ rad/sec.

Use the bilinear transform to design a first order discrete-time all-pass system. Design your system to provide a phase shift of $\pi/2$ radians at $f = 0.1$ cycles/sample. The system is to use a sample frequency of 50 ksp/s. Describe your system using a difference equation, and show how to find all required filter coefficients.