EE 3054 - QUIZ 6 - Spring 2012

① A causal discrete-time LTI system is implemented using the difference equation $y(n) = x(n) + x(n-1) + 0.5y(n-1)$.

a) Sketch the pole-zero diagram
b) Find the dc gain
c) Find the value of the freq. resp. at frequency $\omega = \pi$
d) Find $|H^f(0.5\pi)|$
e) Based on (a-d), roughly sketch the freq. resp. magnitude $|H^f(\omega)|$. Indicate its value at $\omega = 0$, 0.5π, and π.
f) What is the output produced by the input signal $x(n) = 2$?

② Design a simple real causal discrete-time LTI system that

a) annihilates the signal $\cos(\frac{2}{3}\pi n)$
b) has a dc gain of unity
c) annihilates the signal $(-1)^n$.

For the system you design:

a) find the impulse response - sketch $h(n)$.
b) find the difference equation
c) find simplified formulas for $|H^f(\omega)|$ [OPTIONAL - extra credit 1 pt]
d) show the pole-zero diagram
e) roughly sketch the freq. resp. magnitude, $|H^f(\omega)|$, based on zeros of system.

③ Matching problem (next page).

The impulse responses, frequency responses, and pole-zero diagrams of 4 causal discrete-time LTI systems are shown. But the diagrams are out of order. Match each diagram by filling out the following table.

$h(n)$	$\lvert H^f(\omega)\rvert$	P-Z
1		
2		
3		
4