ASSIGNED: Mar. 31, 2006. **READ:** Part 8 of Official Lecture Notes (available on-line).
DUE DATE: Apr. 07, 2006. **TOPICS:** Poles & zeros & frequency response; exam review.

Show work on separate sheets of paper. Include all hand and Matlab plots and code. This entire problem set consists of problems from previous EECS 206 Exams #3.

[10] 1. Rewrite $\frac{1}{2}(1+j)(j)^n + \frac{1}{2}(1-j)(-j)^n$ entirely in terms of sinusoids.

[10] 2. Determine a (2,2) ARMA difference equation having the gain fumction $|H(e^{j\omega})| = \sqrt{(3+4\cos\omega)^2 + 16\sin^2\omega}/\sqrt{(1+2\cos\omega)^2 + 4\sin^2\omega}$.

[10] 3. Determine the simplest MA system that eliminates $3\cos(\frac{\pi}{2}n) + 4\cos(\pi n)$.

[10] 4. A system has difference eqn. $5y[n] + 3y[n-1] + y[n-2] = 7x[n] + 6x[n-1] - x[n-2]$. Compute the response $y[n]$ if the input $x[n] = 9 + 2\cos(\frac{\pi}{2}n) + 3\cos(\pi n)$.

[10] 5. System has pole −zero diagram : Output y[n] $= 9\delta$[n − 1] if the input x[n] = what?

[10] 6. Compute the inverse z-transform of $\frac{z^2-5z+6}{z^2(z-1)}$. **Hint:** Do not use partial fractions.

[10] 7. The filter eliminating $\omega = \frac{\pi}{3}$ and $\omega = \frac{2\pi}{3}$ has impulse response $h[n] =$?

[10] 8. Draw the **pole-zero plot** for a filter that will eliminate a signal having period=8 while having as little effect as possible on any other signals that may be present.

[10] 9. $[(z-0.7)(z^2+1)(z+1)]/[(z-0.8e^{j\pi/3})(z-0.8e^{-j\pi/3})(z-0.9e^{j3\pi/4})(z-0.9e^{-j3\pi/4})]$. Sketch the relative magnitude of its frequency response (i.e., gain function).

[10] 10. $x[n] \rightarrow \overline{|y[n] = x[n] + x[n-1] + x[n-2] + \ldots + x[n-5] + x[n-6] + x[n-7]|} \rightarrow y[n]$

Here input $x[n]$ is a zero-mean, real-valued, and periodic signal having period=8.

Make a stem plot of $y[n]$. Don't worry about the vertical scale.

"Demographer: someone who thinks the average Miamian is born Cuban and dies Jewish."