REVIEW FOR EE 317 FINAL EXAM (Spring 2001)

- Make sure you are also familiar with the material covered on Midterm Exams #1 and #2. The Final Exam is cumulative.

Ideal sampling of continuous-time signals:

- Basic block diagram of ideal sampler (mult. by pulse train, conv. to sequence)
- Mathematical representation of sampled signal
- Sampling interval, sampling frequency
- Fourier transforms of sampled signals (repeated, frequency-shifted spectra)
- Nyquist sampling theorem
- Aliasing
- Nyquist rate
- Nyquist frequency
- Anti-aliasing filter

Reconstruction of sampled continuous-time signals:

- Basic block diagram of ideal reconstructor (conv. to impulse train, ideal LPF)
- Requirements of ideal lowpass filter used in reconstruction
- Mathematical representation of reconstructed signal
- Limitations of practical reconstruction systems
- Effects of aliasing on reconstructed signals

Discrete-time signals:

- Distinction between discrete-time and cont.-time signals – f[n] vs. f(t)
- Digital signal as special case of discrete-time signal
- Unit step function – discrete-time form
- Unit impulse function – discrete-time form
- Time-reversal, time-scaling, and time-shifting of discrete-time signals
- Amplitude reversal (inversion), scaling, and shifting
- Even and odd signals
- Signals periodic in *n*

Properties of discrete-time systems:

- Linearity
- Time-invariance
- Memory
- Invertibility
- Causality
- BIBO stability
- Special cases for linear time-invariant (LTI) systems

Discrete-time systems:

- Modeled by difference equations
- LTI systems modeled by difference equations with constant coefficients
- Impulse response
- Convolution in discrete time (the convolution sum)
- Mathematical and graphical approaches to convolution
- Finite impulse response (FIR) vs. infinite impulse response (IIR) systems
- "Exponential function" in discrete time ($a^n u[n]$)
- Step response of discrete-time systems

The Z transform:

- Mathematical definition
- Bilateral vs. unilateral Z transforms
- Importance of region of convergence (ROC)
- Right-sided (causal) vs. left-sided (anti-causal) signals
- Two-sided (non-causal) signals
- Poles and zeros in Z transforms
- Plots of ROC in the complex plane (ROC outside/inside circle or annular ring)
- Overall ROC is intersection of individual ROCs
- Effect of time-shifting on Z transform and ROC (bilateral vs. unilateral transforms)
- Linearity, real (time) shifting, and convolution properties
- Inverse transform via partial fraction expansion
- Relationship between Z transforms and difference equations