

### 332:345 – Exam-2 Review Topics – Fall 2009

- z-transforms, definition and properties, region of convergence.
- Inverse z-transforms using long division followed by partial fraction expansion.
- Solving difference equations with initial conditions, e.g., load amortization and retirement account examples.
- Discretization methods of analog transfer functions, i.e., starting with  $G(s)$ , obtain  $G(z)$ . Forward and backward Euler, trapezoidal/bilinear, and impulse invariance transformation methods.
- Transform the I/O differential equation for  $G(s)$  into a difference equation for  $G(z)$ .
- Zero-order-hold discretization method:  $G(z) = (1 - z^{-1}) \mathcal{Z} \left[ \frac{G(s)}{s} \right]$ .
- Feedback control systems and their digital versions using zero-order holds.
- PID control systems. Calculating the step and ramp responses of the closed-loop control system. Calculating the effect of disturbance inputs on the controlled system.
- MATLAB functions for implementing feedback control systems.
- Fourier series for complex-valued and real-valued periodic signals. Parseval identity for Fourier series.
- Fourier transform, definition and properties.
- Inverse Fourier transforms. Parseval identities.
- Discrete-time Fourier transforms and their inverses.
- Propagation filters, pulse spreading, dispersion compensation filters.
- Chirped pulses and their use in radar. Pulse compression filters.
- Sending pulses through bandlimited channels and working out the received output signals. Distortion effects of channels, such as pulse broadening.

#### Reading Materials:

Primarily your class notes. Textbook chapters 3–6. Pulse propagation notes.

#### Practice Problems:

Textbook problems (assigned or not assigned) from above chapters.

Examples in class and in text.

Sample exam problems (solutions are not available).

Matlab programming ideas in labs 1–4.