At the time of the first exam in EE572, you should be able to perform the following objectives:

**Exam I Objectives:**

- Do all EE422 objectives
- List the advantages of digital control
- Model processes using discrete state variables
- Evaluate fixed point and floating point numbers
- Understand and model the process of sampling (including the sampling theorem)
- Understand quantization and its effects
- Understand encoding
- Understand the A/D and D/A (signal conversion) process
- Derive the Z-transform from the Laplace transform
- Derive the important properties of the Z-transform
- Evaluate the inverse Z-transform using long division
- Define a mapping between the Z-plane and the S-plane
- Derive the bilinear transform from the mapping, $z=\frac{e^{sT}}{2}$
- Obtain digital controllers using bilinear transformations or invariant techniques
- Know 2 ways to discretize continuous models and which method is preferred and why
- Know the relationship between the eigenvectors and eigenvalues of $\hat{A}$ and $A$
- Solve the discrete state variable equation using both time and frequency domain techniques
- Find the discrete state transition matrix ($\hat{A}^k$) 3 ways (at least 2 ways for non-EE422 people!)
- Decouple discrete state variable models and draw simulation diagrams to determine controllability and observability
- Define controllability for discrete systems from a state feedback point of view
- Design feedback regulators to meet transient response specifications for a discrete multi-input controllable system.
- Stabilize discrete multi-input stabilizable systems.
- Derive and apply equations for a controller (tracking) architecture to achieve tracking in MIMO discrete systems
- Understand the concept of Deadbeat control and calculate minimum time to achieve deadbeat
- Develop software to implement a digital filter, a regulator, or a tracker