FINAL STUDY GUIDE

In order to do well on the final exam, you should be able to do the following:

1. Design a dynamic vibration absorber to reduce the vibrations of a specified mode of a continuous beam. Describe how this process is simplified by assuming low modal density.

2. Define collocated vs. non-collocated control of vibrating systems. Sketch the root locus of a system with either collocated or non-collocated sensors and actuators.

3. Describe the properties of stationary random processes vs. non-stationary random processes.

4. Compute the following statistics of the output(s) of a system subjected to stationary vibration: mean, standard deviation, autocovariance, and autocorellation. Use the stationary assumption to compute these values as $t \to \infty$.

5. Describe how fatigue failure occurs. What approximations are used in making predictions about fatigue failure, and what are the possible (negative) consequences of using these approximations? Under which conditions are these approximations accurate?

6. Describe how sudden failure occurs. What approximations are used in making predictions about sudden failure, and what are the possible (negative) consequences of using these approximations? Under which conditions are these approximations accurate?

7. Design a dynamic vibration absorber for minimizing the mean square value of a response.

The following skills from the first half of the course will also be relevant:

1. Derive the equation(s) of motion of a mechanical system using force/moment balance or energy methods.

2. Identify from a transfer function $G(s)$ the following: the effective mass m_{eq}, the effective damping c_{eq}, the effective stiffness k_{eq}, the natural frequency ω_n, the damping ratio ς, and the time constant T of the system. (Note, not all of these are applicable to every system.)

3. Compute the force or displacement transmissibility of a vibrating or rotating system. Sketch the frequency response of the force or displacement transmissibility.