ECE 141L – Spring 2008

Test II Review

1 Chapter III

(a) Set up state space for electrical, mechanical, and hybrid systems.

(b) Set up phase space from a transfer function.

2 Chapter IV

(a) Determine characteristics of the step response for a first-order system or design a system to achieve those characteristics.

(b) Determine the characteristics of the step response for a second-order system or design a system to achieve those characteristics.

(c) Know when extra poles and zeros interfere with the assumptions of a dominant pair of poles.

3 Chapter V

(a) Translate a block diagram into a signal flow graph.

(b) Determine the transfer function of a signal flow graph.

4 Chapter VI

(a) Generate a Routh array for a transfer function and determine regions of stability (by hand). Be sure to know how to handle rows with all zeros and rows with leading zeros.

(b) Find the value of one or more free parameters to obtain marginal stability and the frequency of oscillation for marginal stability.

5 Chapter VII

(a) Find system type, static error constants, and steady state error for unity feedback systems.

(b) Determine equivalent forward transfer function for systems not fitting the unity feedback paradigm, and find system type, static error constants, and steady state error for those systems.

(c) Design a system satisfying both stability and error considerations.

6 Computational Tools

(a) MATLAB: Determine step response characteristics for a system using the `step` command.

(b) MATLAB: Use `tf` and `zpk` functions to set up transfer functions.

(c) MATLAB: Use `parallel` and `feedback` functions along with algebra to generate transfer functions of cascade, parallel, feedback, and more complex systems.

(d) MATLAB: convert between polynomial ratio and zero-pole-gain representations of transfer functions.

(e) MATLAB: Model a system using Simulink and make a plot of the input and output of the system.

(f) MATLAB: Model a system using the `lsim` command and determine steady-state error graphically.

(g) MAPLE: Solve and simplify transfer functions.

(h) MAPLE: Generate and translate a Routh array.