EECS 216 – Winter 2008

Homework #10–Assigned April 1–Due Tuesday April 8

- **Grading:** Not all problems will be graded, but you should do all of them.
- **Submission:** Due in *black box in room 4230 EECS* **before 5:00** on Tues. April 8.
- **Read:** Text sections 5.7 and 5.8. **Topic:** Applications of Laplace transform

1. *(25 points: 5@5)* The response of an LTI system to $e^{-2t}u(t)$ is $[e^{-3t} - e^{-4t}]u(t)$.
   - (a) Compute the transfer function $H(s)$ of the system.
   - (b) Compute the steady-state response to $x(t) = \sqrt{5}\cos(4t)$.
   - (c) Compute the poles and zeros of the system.
   - (d) Compute the impulse response of the system.
   - (e) Compute the differential equation implementing the system.
   - This is an important problem: You can compute many things easily!
2. *(20 points: 10+10)* Text #5.22ab. System identification. Compare to first problem. A single input-output pair determines all other input-output pairs!
3. *(15 points:)* Text #5.23. s-plane circuit. Remember how you had to do this in 215?
4. *(25 points: 5+10+10)* Text #5.28. Feedback control system. Make these changes:
   - (a) Compute the Laplace transform $Y(s)$ of the step response $y(t)$ (no change).
   - (b) Compute $y(t)$ for a=7 and K=12. Did feedback speed up the step response?
   - (c) If $a = -1$, prove that NO value of K can stabilize the unstable system.
5. *(15 points: 3@5)* Text #5.29abc. Feedback control system. Use final value theorem. HINT: Your answer to (b) should involve the numbers $(-3 \pm \sqrt{5})/2$.