

EE 4CL4 – Control System Design

Homework Assignment #1

1. Explain how a high-gain feedback loop can be used to produce an implicit inverse of the plant model. **(20 pts)**
2. List under what conditions might an open-loop controller be acceptable? Describe the advantages of using an open-loop controller as compared to a closed-loop controller such a case? **(20 pts)**
3. Explain why a closed-loop controller is preferable to an open-loop controller for most control problems? **(20 pts)**
4. A nonlinear system has an input-output model given by:

$$\frac{dy(t)}{dt} + (1 + 0.2y(t))y(t) = u(t) + 0.2u(t)^3$$

- a. Compute the operating points, i.e., values of y for a particular value of u , for $u_0 = 2$. (assume they are equilibrium points, i.e., $\frac{dy(t)}{dt} = 0$)
- b. Obtain a linearized model for each of the operating points above. **(40 pts)**