ECE 874 - Spring 2014 **Test 2 In-Class Component** Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(80 points total)



1. (5pts) The control has been proposed for the system model shown below. The system parameters a,b,c > 0. The controller will then be applied to the actual system. Describe three potential weaknesses in the proposed control.



Potential weakness 1: Exact model knowledge control, may not be able to exactly measure the parameters of the physical system

Potential weakness 2: Canceled the term which naturally acts to stabilize the system, i.e. control signal may be unnecessarily large.

Potential weakness 3: The term  causes a singularity at 

Potential weakness 4: May have error in the measurement of 

Potential weakness 5: May have un-modeled dynamics in the original system that aren’t accounted in the control design

Potential weakness 6: Need to state that k>0

1. (10pts) are given. Show that the system is exponentially stable at the origin.







1. (30pts) Design a handcrafted backstepping control design that stabilizes the following system to . Use standard definition . Circle all the terms that would be needed to implement the control *u(t)*. Show all work including a stability analysis and that all signals are bounded.







