Massachusetts Institute of Technology

Thermodynamics of Materials

3.00 Fall 2002

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Problem Set 1: Due Mon. Sept. 16, Before 5PM in 13-5114

Exercise 1.1

Bad News Your plans next summer to catch a lucrative job at a dotcom have been mercilessly dashed by "irrational exuberance."

Good News You have an idea that may be incredibly lucrative anyway!

Bad News It turns out that this year's fad for the mollycoddled, easily amused, and more easily fooled students at Harbored University is the care and feeding of cute little furry animals, like gerbils and kittens. Your idea is that. at winter and spring break, these heartless students will need a place to store their cute little pets. You have decided to rent some space and create the **I***vyleague* **H***otel for* **T***ame* **F***urry* **P***ets*

Good News The parents of the students at Harbored give them credit cards with unlimited credit. Furthermore, neither they nor their parents can count very well.

Bad News Cheap rental space nearby is hard to find and so you will have to rent extra space by the week depending on your current gerbil occupancy (known as CGO in the pet hotel biz.)

More Bad News The predictable students bring you Gerbils at a constant rate of $\dot{G}_{in}$ and kittens at rate $\dot{K}_{in}$ and pick them up with a constant rate $\dot{G}_{out}$ and $\dot{K}_{out}$

Carefully consider all the various processes that would affect your current gerbil inventory (CGO) such as $\dot{E}$ (the rate at which a single kitten will eat a gerbil if given the opportunity) or $\dot{B}$ (the rate at which a female gerbil will give birth), and anything else that you consider relevant.

Is it reasonable that your average CGO is a function of only $\dot{K}_{in}$, $\dot{K}_{out}$, $\dot{G}_{in}$, $\dot{G}_{out}$, $\dot{E}$, and $\dot{B}$?

Construct a model for your current gerbil inventory (CGO). You may need to introduce symbols for processes other processes that affect your inventory, if you do so, define them carefully.