

This problem set had the following objectives: ¹

1. To make a model describing the behavior of a system, given certain constraints.
2. Emphasize the importance of the assumptions made. There were several correct answers, depending on the assumptions made at the beginning.
3. Introduction to conservation principles.
4. Promote creative thinking.

Once you had established the assumptions and defined the variables to be incorporated in the model, you were expected to establish a balance equation or equation for the conservation of gerbil population.

$$CGO(t) = \int_0^t (Inflow - Outflow) dt'$$

A similar balance equation can be written for kitten population or current kitten occupancy (CKO). Lots of factors could affect the gerbil population. To name a few, birth and death rate of gerbils, birth and death rate of kittens, gerbil escape rate, kitten escape rate etc...

All the assumed factors need to be incorporated in the balance equation properly. For example, the current gerbil occupancy is a function of the number of cats at that time (provided you have an assumption that cats do eat the gerbils!).

$$CGO(t) = \text{other terms} + \int_0^t \dot{E}(CKO) dt'$$

where CKO is the current kitten occupancy.

To rent space for gerbils and kittens, you need to know, on an average, the gerbil population in a week. This is given by

$$\langle CGO \rangle = CGO(\text{previous week}) + (1.0/\text{week}) \int_{\text{weekstart}}^{\text{weekend}} (C\dot{G}O) dt$$

Points for the problem solution were awarded partly for the writing down the assumptions and definitions (40%), partly for writing down the balance equation (30%) and rest for the model written down within the constraints and liberties assumed.

¹same objectives as last year's problem set 1