## Vibrations & Control

## Eugene M. Cliff HW Set 5

September 30, 1999

These problems will be due in class on Thursday, 7 October. Carefully describe what you are doing and define any symbols that you introduce

- 1. Ogata, Problem B-4-11.
- 2. Derive the transfer function from the input  $x_i$  to the output x for the system in Problem A-3-14, in Ogata.
- 3. A 1 inch diameter copper sphere is initially heated to 200°C and then dropped into an oil bath at 15°C. After ten minutes the copper has cooled to 85°C. Estimate the time-constant for the cooling process. Estimate the convective film coefficient h. The specific gravity of copper is about 9.
- 4. Ogata, Problem B-6-1.
- 5. Ogata, Problem B-6-4. Work this out for the case with  $k_1 = k_2 = 5$ lb/ft and b = 5lb/(ft/s).