

Homework 1

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Problem 1
Statement:

Consider the system shown in Figure 1. Derive the expression for $y(t)$ in terms of $y(0)$, $\dot{y}(0)$ and $f(t)$.

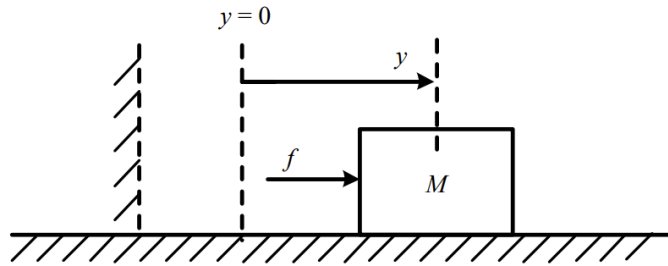


Figure 1: System for Problem 1,2

Solution

Problem 2**Statement:**

Consider the system shown in Figure 1. Calculate an open loop control $f(t)$ to bring $y(t)$ from $y(0) = y_0 \neq 0$ and $\dot{y}(0) = 0$ to $y(1) = 0$ and $\dot{y}(1) = 0$. If M is reduced to $0.9M$, under the same $f(t)$, what will $y(1)$ be?

Solution

Problem 3

Statement:

Describe how you usually adjust the shower water temperature you are comfortable with. What type of feedback do you think you are applying? What are the actuator and sensor?

Solution

Problem 4

Statement:

Identify a feedback control system that is not discussed in this chapter and describe how feedback works in the system.

Solution

Problem 5
Statement:

Consider the toilet water tank, shown in Figure 2. One way to reduce the amount of water used for each flush is put a rock inside the water tank. Would this cause the water level to rise higher when the fill valve is closed off? Give your reason.

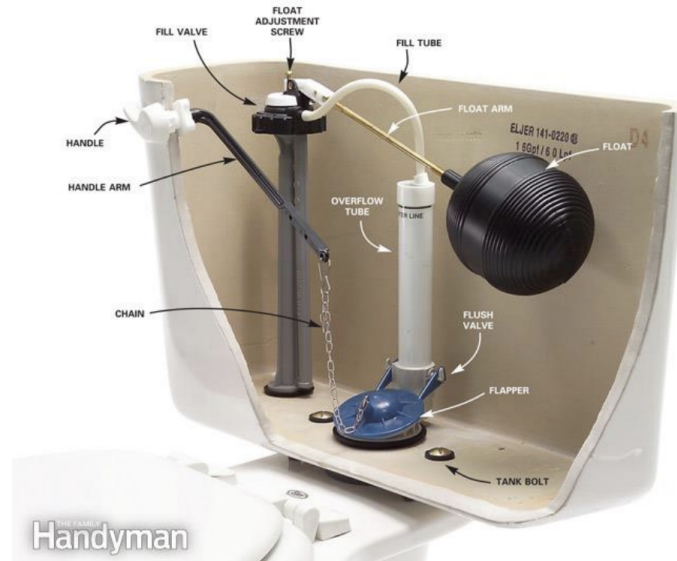


Figure 2: System for problem 5

Solution

Problem 6

Statement:

How would you set the desired water level in the toilet water tank, shown in Figure 2, and the desired shaft rotation speed in the Watt steam engine, shown in Fig. 3?

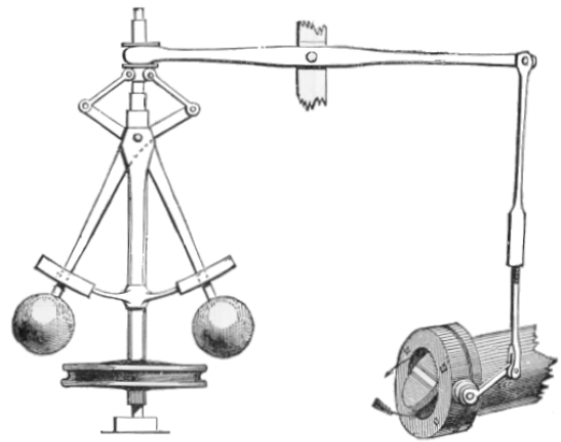


Figure 3: Watt engine diagram

Solution