

This tutorial, leading into assignment 1, has two main goals: to get even more comfortable with concept of process control; to recall the concepts of process simulation you learned about in your prerequisite courses.

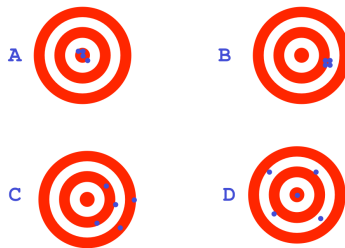
Question 1 [4]

Engineers do not design sensors, they select them.

Consider a temperature sensor.

1. What does it mean for a temperature sensor to have “high accuracy”.
2. What does it mean for a temperature sensor to have “high reproducibility”.

Use the following figure to help with your answers.

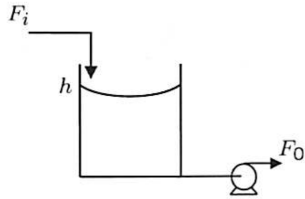


Question 2 [4]

What is the economic cost of an error of 0.5% in the flow rate for a pipeline that carries 100,000 barrels/day of crude oil? (assume the error is not in your favour, i.e. it really is a cost, and not a profit)

Question 3 [4]

Consider the following tank system:



Write out the mass balance for the tank in the form:

$$\text{rate of accumulation of mass} = \text{rate of mass flow in} - \text{rate of mass flow out}$$

so that you obtain a differential equation relating height h , flows F_i and F_o , and the cross-sectional area, A . The flows are considered to be volumetric flows.

Question 4 [4]

Consider an earlier problem from class. If the height, h , in a tank is given by $\frac{dh}{dt} = -\frac{h}{AR}$. There is no flow into the tank, just a flow out. A is the cross sectional area, and R is a constant. Find the Laplace transform $H(s)$.