Lab 6 Prelab — The Simulink "Switch" block

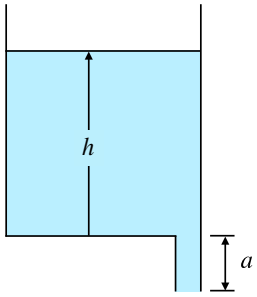
The big picture:

Model a draining tank.

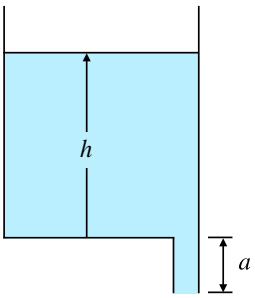
Simulate the response of the draining tank using MATLAB and Simulink.

Implement a "Switch" block to shut off the flow when the tank is empty.

Submit a memo with your results.



Individually, do the following:

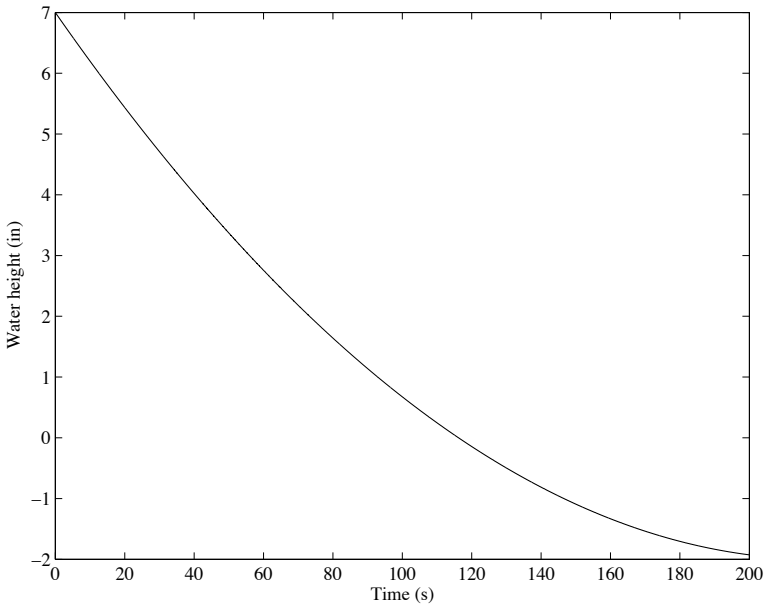


Part I

1. *On paper,* model the draining tank.
   - The tank is open to the atmosphere.
   - The cross-sectional area is constant.
2. *On paper,* sketch the simulation diagram for the DE model of the draining tank.
3. Draw the simulation diagram in Simulink.
4. Create a MATLAB m-file that runs the simulation. Use the following values:
   - Tank cross-sectional area $30\ \text{in}^2$
   - Orifice diameter $0.25\ \text{in}$
   - Orifice height $a = 2\ \text{in}$
   - Discharge coefficient 0.6
   - Initial water height $h(0) = 7\ \text{in}$
   - Simulation time $200\ \text{s}$

5. Plot the water level in the tank over time in *inches*.

Answer



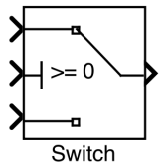
Seek help if you can't get this answer.

Do not continue on until you get the correct answer.

According to your plot, the tank continues to drain after it is empty!

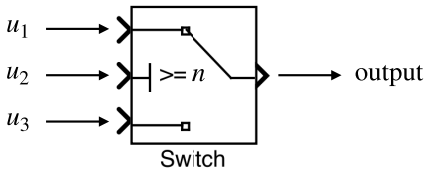
Use the "Switch" block to shut off the flow when the tank is empty:

- *Signal Routing* > *Switch*

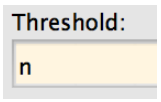


- The "Switch" block is an **`if-else-end`** structure:

```
if u2 ≥ n          %  Logical condition
   output = u1     %  Output if condition is true
else
   output = u3     %  Output if condition is false
end
```



- You set the threshold n in the "Switch" block:



Part 2

1. Modify your Simulink diagram from Part 1 to incorporate a "Switch" block that shuts off the flow when the tank is empty.

2. Run the simulation using the parameter and simulation values in Part 1.

3. Plot the water level in the tank over time in *inches*.
    - Visually verify that the "Switch" block operates as expected.
    - Format your plot according to our usual graphing standards.

4. Use the Lab 6 prelab memo template for your submission.
    - Replace all placeholder text where indicated.
    - Copy and paste your nicely formatted plot into the memo: **Edit → Copy Figure** in the MATLAB figure window. **Do NOT use the Snipping Tool.**
    - Give the figure a descriptive caption.
    - Attach printouts of your Simulink model and MATLAB m-file.

Submit your Lab 6 prelab memo by 5:30 pm on Wednesday, April 16.