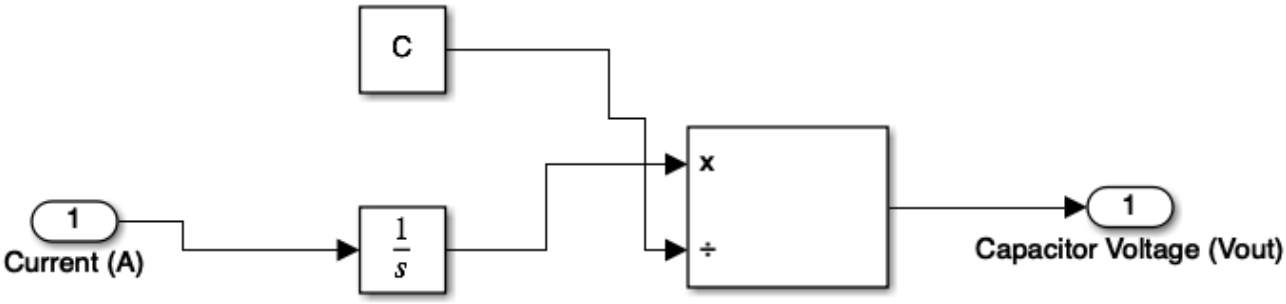
Robotics and Intelligent Systems (RIS) LAB 2

Lab 1 (Tasks 1.1 - 1.3)

Submitted By
Ramin Udash

Task 1.1. Explain why Fig. 1.4 represents the model of a capacitor by writing down the equation it implements.



From Volta's law of capacitance, we know,

$$C = \frac{Q}{V}$$

here, C= Capacitance, Q=Current, V= Voltage

$$V = \frac{Q}{C}$$

$$V = \frac{1}{C} * \int I$$

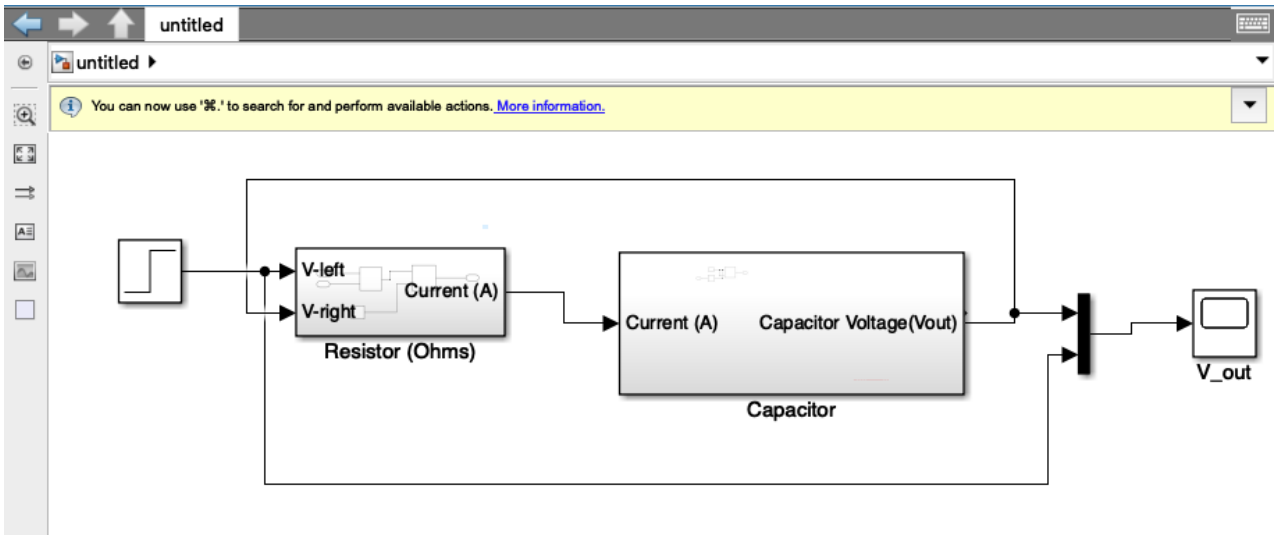
$$I = C * \frac{dV}{dt}$$

Task 1.2. Proceed as follows:

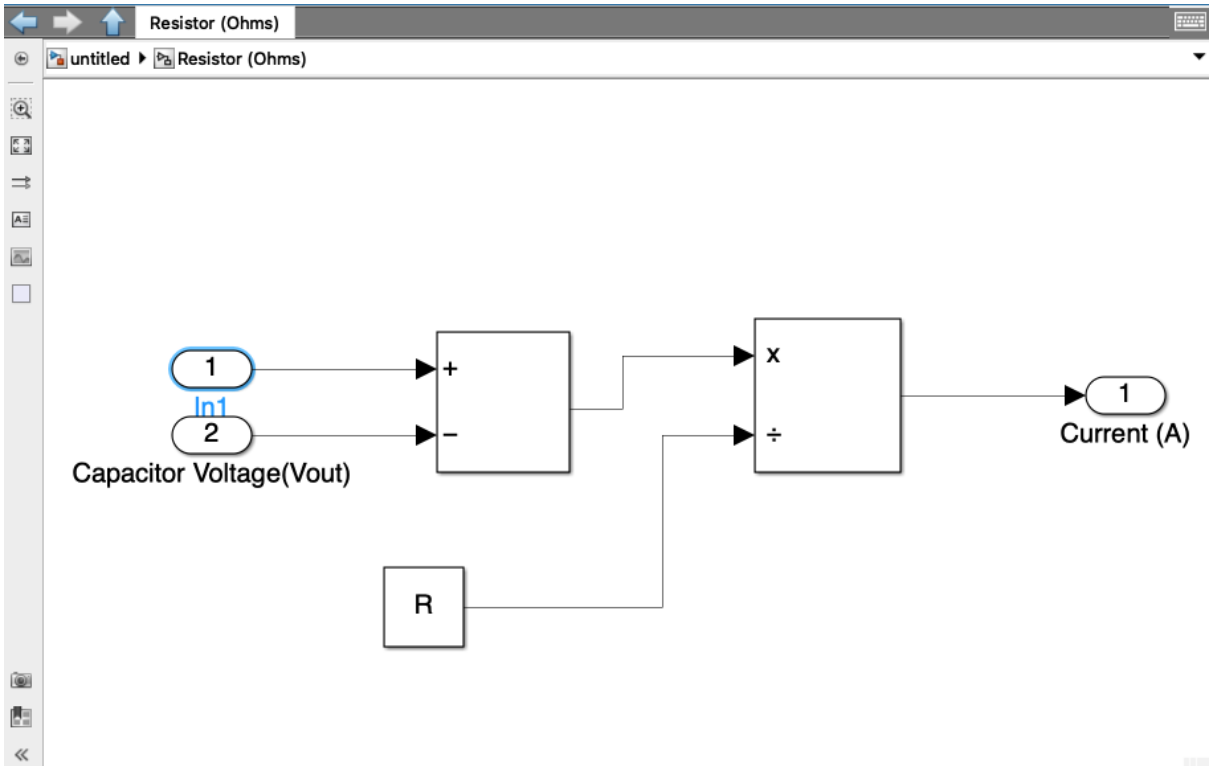
The RC Model: We join together the resistor and capacitor subsystems from 1.3 and 1.4 in the lab manual to one that looks like in figure 1.5.

You may have to delete the automatically created i/o ports of the subsystems and replace them with appropriate connections.

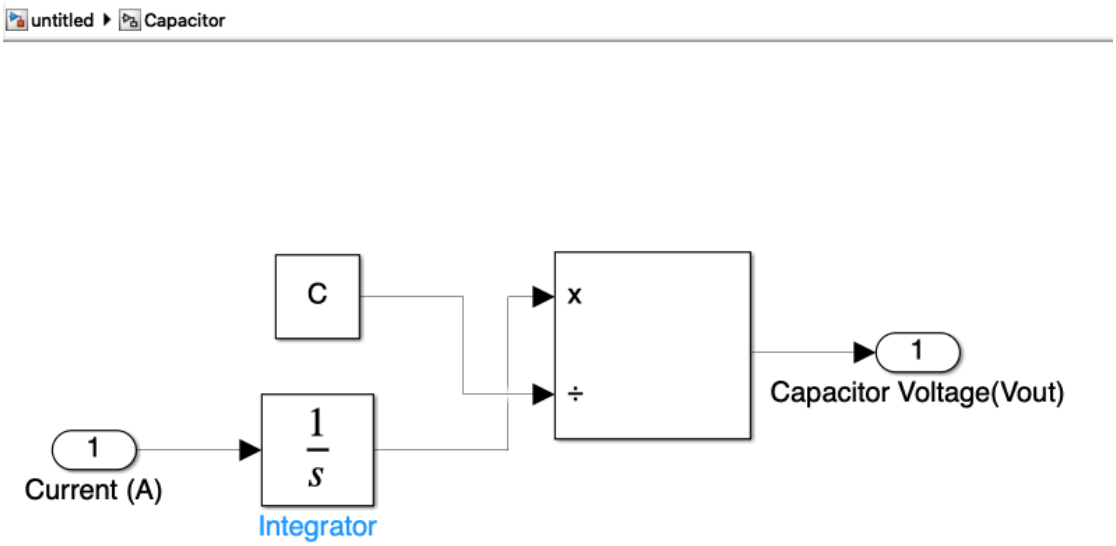
Fig 1.5 RC Model:



The resistor subsystem:



The capacitor subsystem:



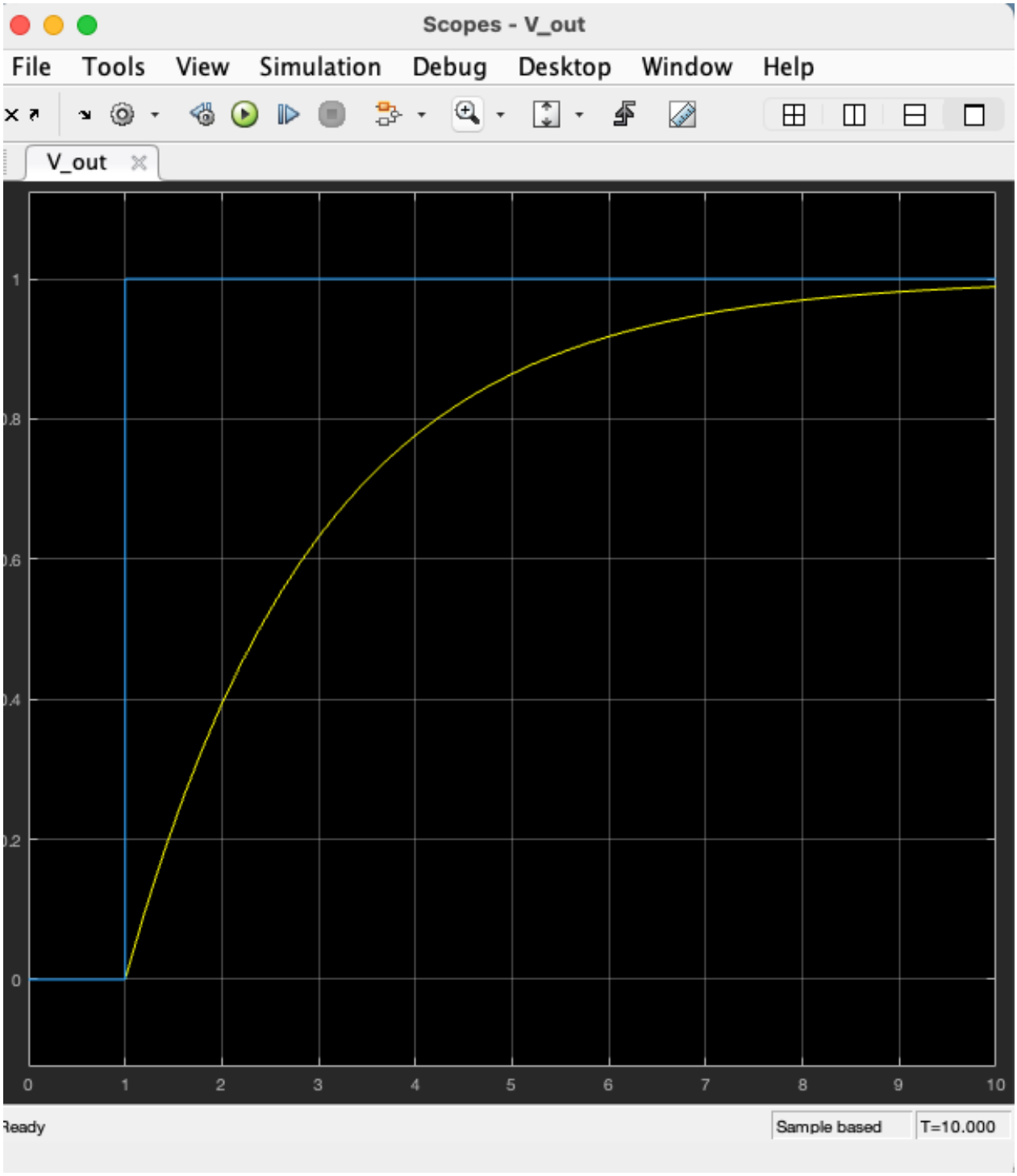
- What is the time-constant of this system? How can you see it in the plot? Change the simulation-time (in input field in the tool-ribbon) from the default 10.0 seconds to 5 times this time-constant.

-> In the main model, R was set to R=1e6 and C was set to C=1e-6 i.e., the values of constants R and C in the resistor and capacitor subsystems.

From the plot, in the interval of 1 second and 2 second, the value reaches around 0.625.

– Run the system by pressing Ctrl+T or by clicking the run-button. Look at the output by double-clicking the scope.
- Now change the variables R and C in the workspace and re-run the simulation. Does the scope display change as expected?

-> The value of C was changed to 2e-6 and the following change was observed in the plot:



Task 1.3. Answer the following:

Task 1.3. Answer the following: 1. How many seconds does it take for the initial transient to die off in the output response? 2. What is the expected gain-ratio (ratio of output to input amplitudes) from theory? You can find this by replacing s by jω in the transfer-function and evaluating |H(jω)|. 3. Zoom in the scope to find the amplitude ratio of the output wave to the input wave. Is it as expected?

1. How many seconds does it take for the initial transient to die off in the output response? 2. What is the expected gain-ratio (ratio of output to input amplitudes) from theory? You can find this by replacing s by jω in the transfer-function and evaluating |H(jω)|.

3. Zoom in the scope to find the amplitude ratio of the output wave to the input wave. Is it as expected?