

EENG307: System Identification¹

Lecture 23

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Fall 2022

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²Developed and edited by Tyrone Vincent and Kathryn Johnson, Colorado School of Mines, with contributions from Salman Mohagheghi, Chris Coulston, Kevin Moore, CSM and Matt Kupilik, University of Alaska, Anchorage < >

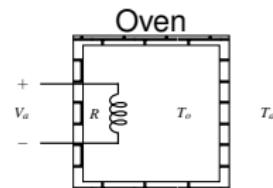
Model Structure

Transfer Function

Example System

First order system

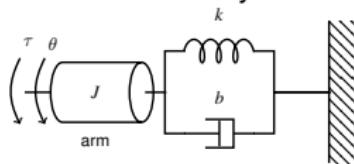
$$K \frac{\sigma}{s + \sigma}$$



Second order system, under-damped

$$K \frac{\omega_n^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$

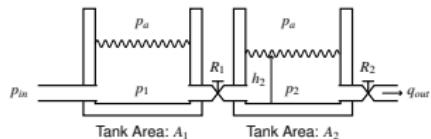
Mechanical System



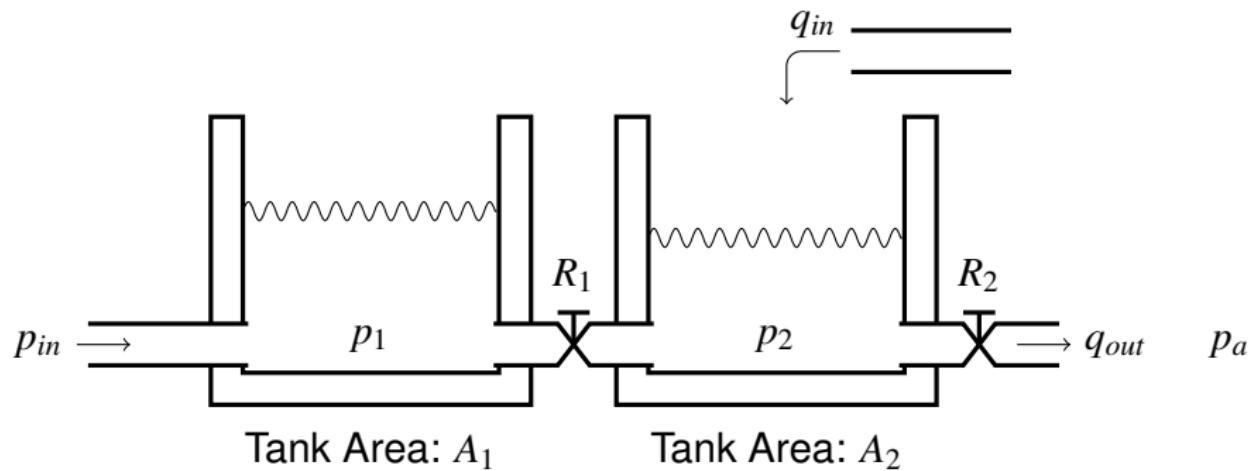
Second order system, over-damped

$$K \frac{\sigma_1 \sigma_2}{(s + \sigma_1)(s + \sigma_2)}$$

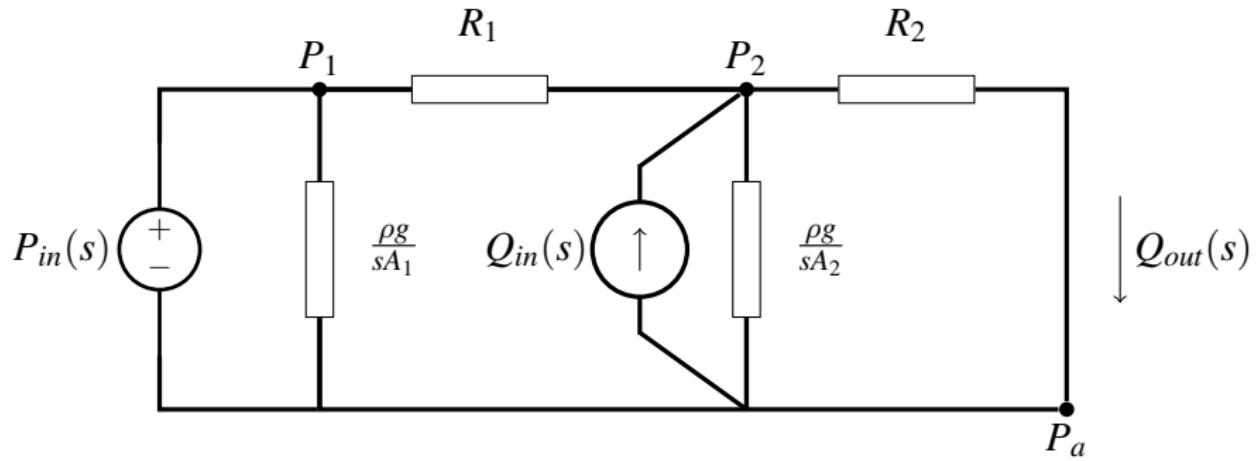
Two Tank System



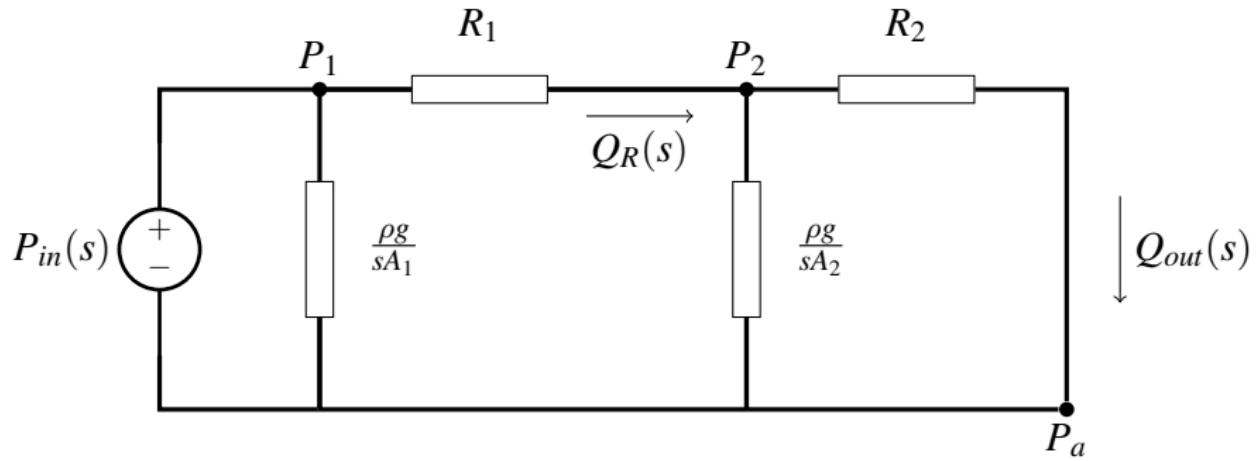
Fluid System Diagram



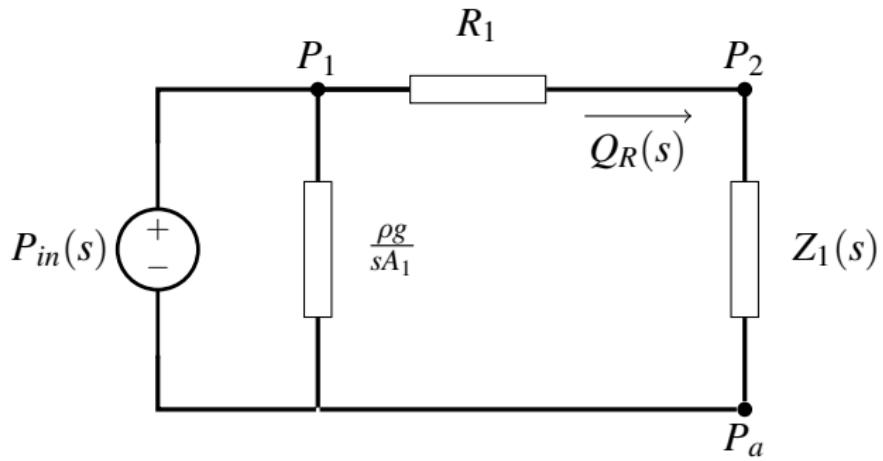
Fluid System Impedance Network



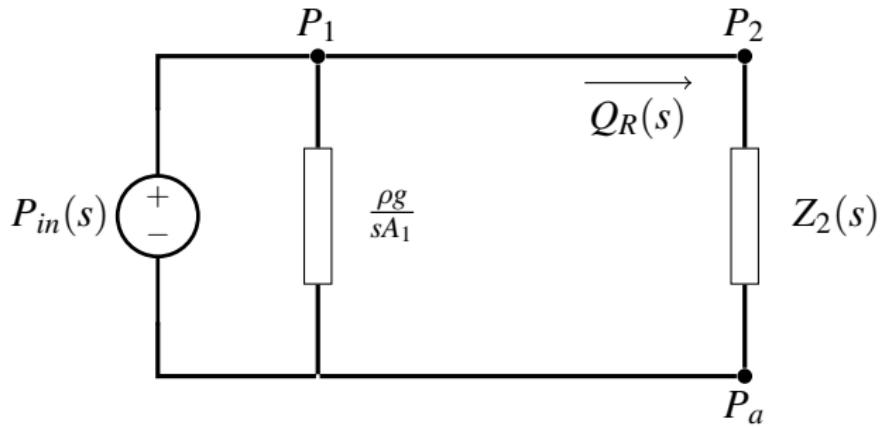
Impedance Network for P_{in} Input



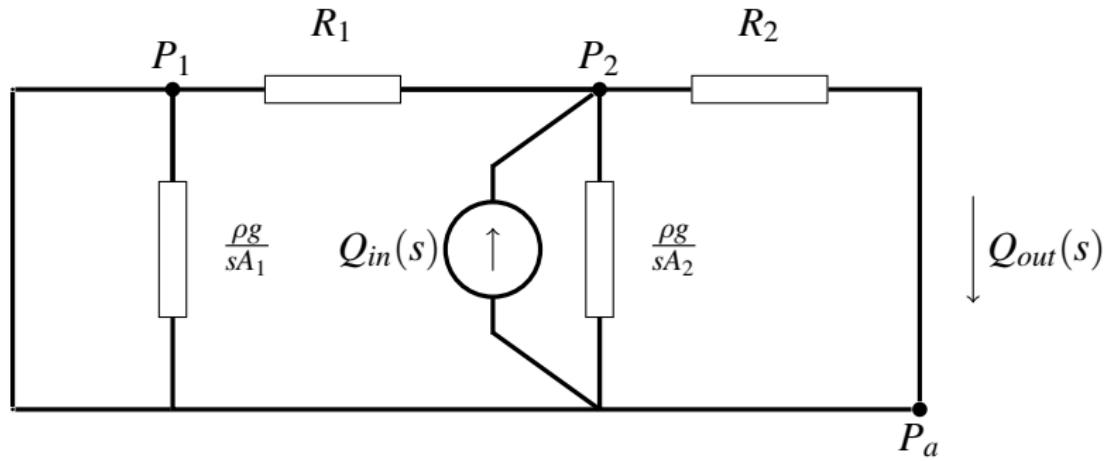
Impedance Network for P_{in} Input - Step 2



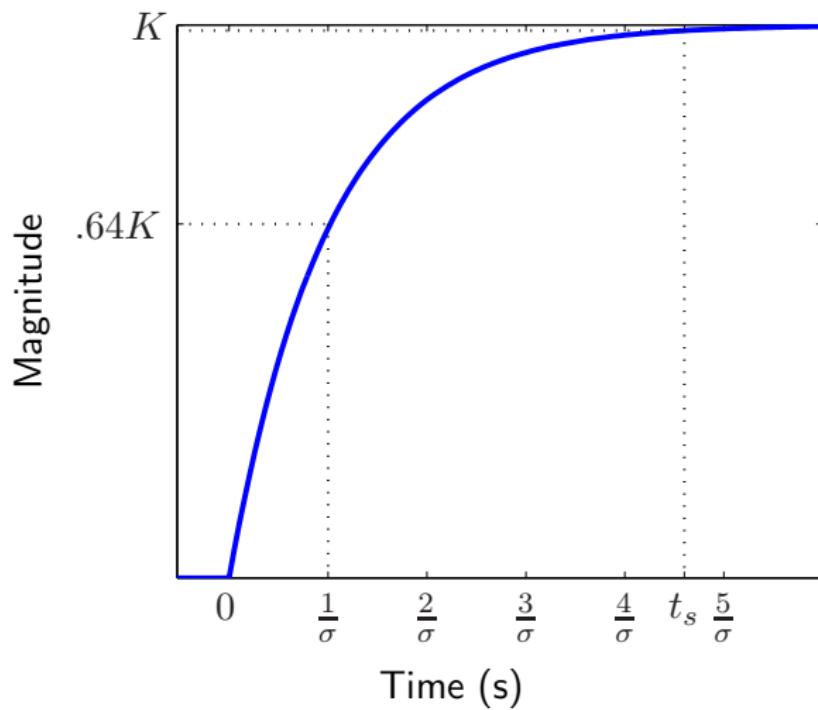
Impedance Network for P_{in} Input - Step 3



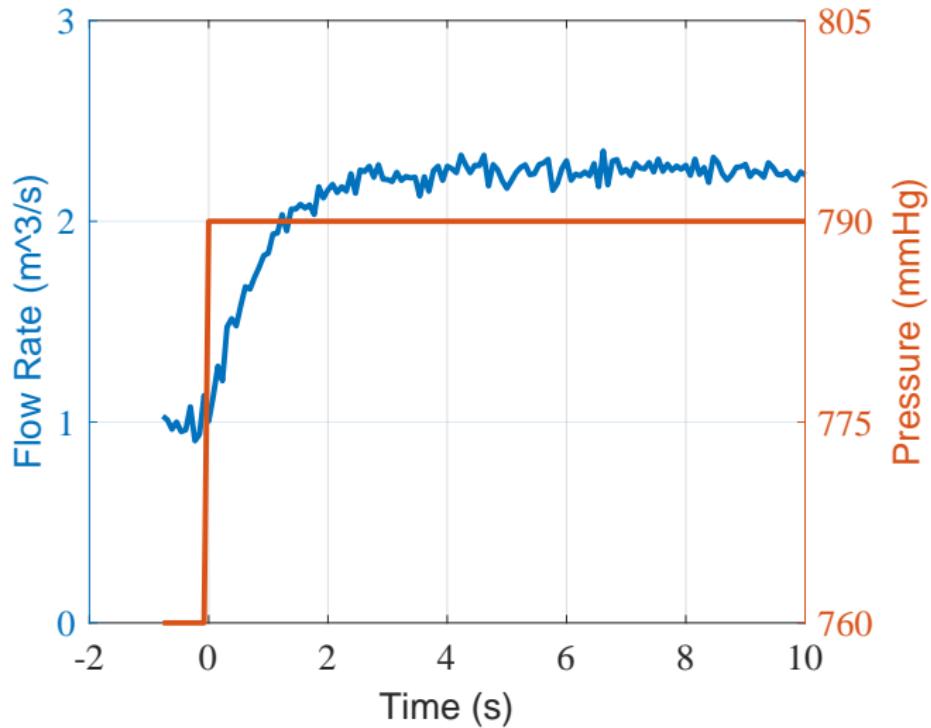
Impedance Network for Q_{in} Input



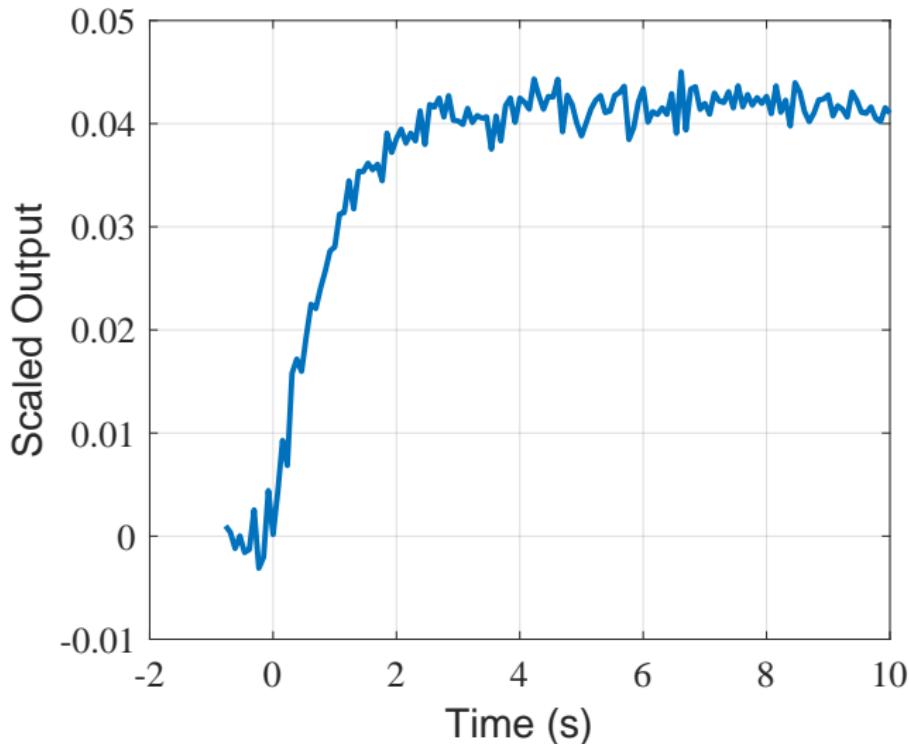
Unit Step Response Plot - First order system



Pressure and Flow Experiment



Scaled Tank Experiment - Unit Step Response



Unit Step Response Plot - Second Order System

