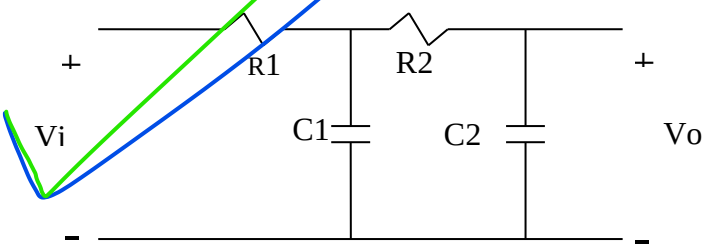
Cairo University
Faculty of Engineering
Computer Dept.

ELC 3252
Control Engineering
3rd year - 2022

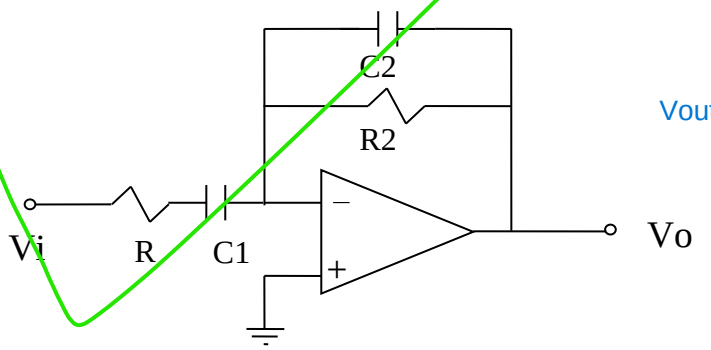
Sheet 2
Mathematical Modeling

1. For the circuit shown, obtain the transfer function Vo(s)/Vi(s).



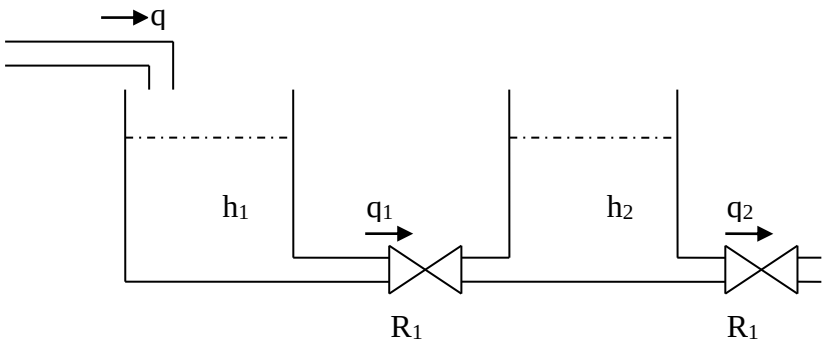
Vo = I/ (SC2)
I = I2 + I3
vin = IR1 + I2/ (SC1)
vin = IR1 + I3 (R2 + 1/SC2)
solve 3 equations simult
kirshoff law
get TF

2. For the Ideal Op-amp circuit shown, obtain the transfer function Vo(s)/Vi(s)

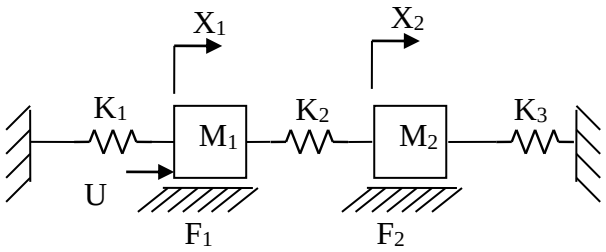


Vout/vin = -Z2 / Z1

3. The figure shows a process plant containing of two tanks of areas A_1 and A_2. Derive the transfer function that relates q_2 to q.



4. Derive the differential equations that represent the mechanical system shown, where U is a force that affects the mass M_1 and hence derive the transfer functions $X_1(s)/U(s)$ and $X_2(s)/U(s)$. If the force U has a value of 1 N find the steady state values of X_1 and X_2.



it is all about math fa to be solved tommorow