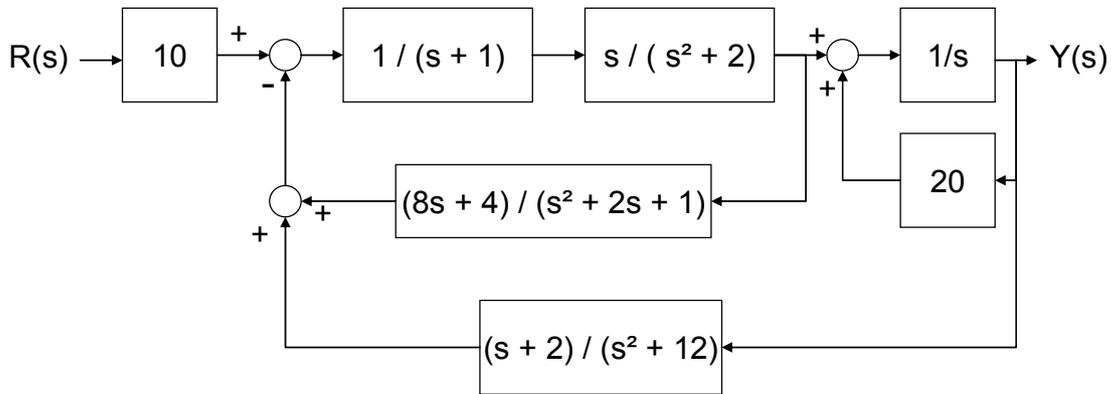
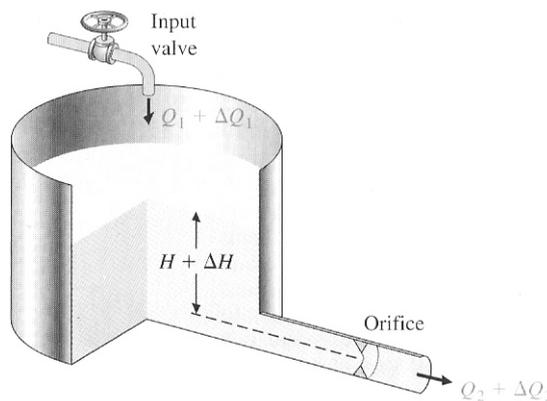


**HW#2 Controls**

1) Give the overall transfer function  $T(s) = Y(s) / R(s)$  for the following:



2) A water tank of horizontal area **A** normally has an incoming flow of  $Q_1$ , and an out flow of  $Q_2$  which is proportional to the square root of the height of water in the tank:  $Q_2 = k H^{1/2}$ . If the incoming flow changes by an amount  $\Delta Q_1$ , then the steady state height will change by an amount  $\Delta H$ , and the output flow will change by an amount  $\Delta Q_2$ . **What is the transfer function  $\Delta Q_2(s) / \Delta Q_1(s)$ ?** You will need to linearize the change in height of the water.



3) Use MATLAB to determine the closed loop transfer function of problem 1, and determine the poles and zeros.