**Chemical Engineering 162 First Midterm Review**

Formulating a control strategy

**Control objectives**

**Manipulated input**- one that can be adjusted by the control system

**Disturbance input**- one that affects the process outputs but that cannot be adjusted by the control system

**Output**- measured or unmeasured

**Constraints**- soft or hard

**Operating characteristics**- continuous, batch, semicontinuous/semibatch

**Safety, environmental, and economic considerations**

**Control structure**

**Positive gain**- an increase in a process input leads to an increase in the process output

**Negative gain**- an increase in a process input leads to a decrease in the process output

**Fail-closed / air-to-open**- if signal is lost, valve will close

**Fail-open / air-to-close**- if signal is lost, valve will open

**Feedforward**- measures disturbance variable and sends this value to a controller, which adjusts the manipulated variable

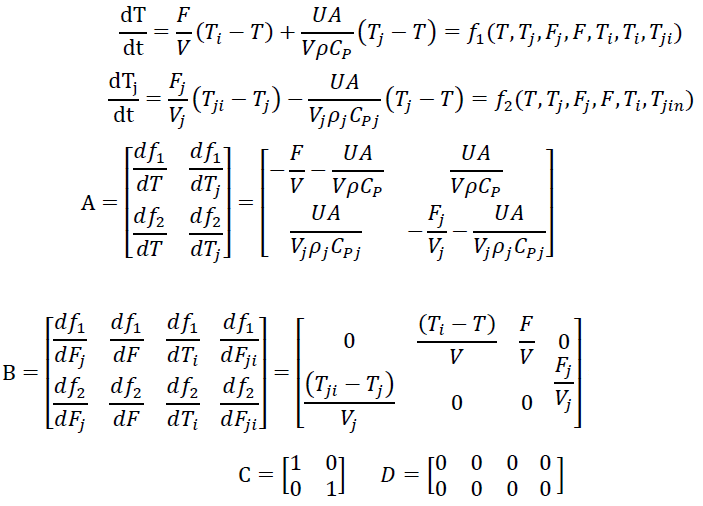
**Feedback**- measures the output variable, compares the value to the desired output value, and uses this information to adjust the manipulated variable

**Setpoint**- desired value of the measured process output

**Mass balances**

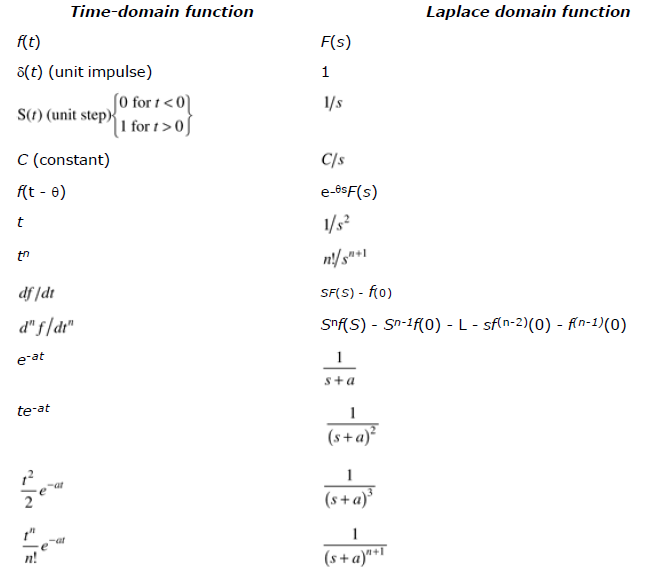
x is the vector of state variables, u is the vector of input variables, p is the vector of parameters, y is the vector of output

**Energy balances**



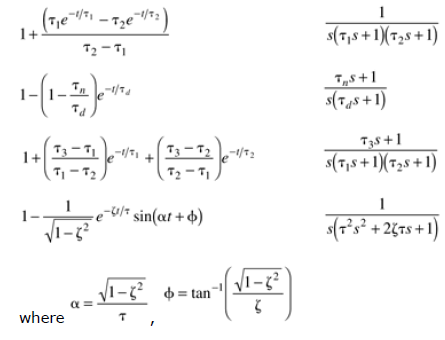
Eigenvalue

Laplace Transform









Transfer functions

The roots of numerator are zeroes.

The roots of denominator are poles.