Problem 4.7

H, L, and V are molar flow rates
y's and x's are mole fractions in vapor and liquid

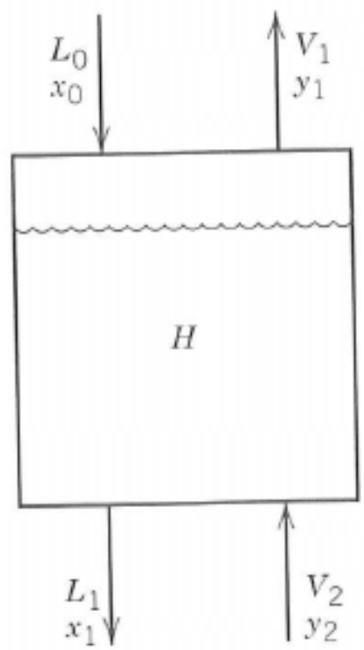

Figure E4.7

Stirred tank blending system
(or stage on distillation column)

- Wanted:

$$\frac{X_1'(s)}{X_0'(s)} \qquad \frac{X_1'(s)}{Y_2'(s)} \qquad \frac{Y_1'(s)}{X_0'(s)} \qquad \frac{Y_1'(s)}{Y_2'(s)}$$

- Given:

$$\frac{dH}{dt} = L_0 + V_2 - (L_1 + V_1)$$

$$\frac{dx_1 H}{dt} = x_0 L_0 + y_2 V_2 - (x_1 L_1 + y_1 V_1)$$

$$y_1 = a_0 + a_1 x_1 + a_2 x_1^2 + a_3 x_1^3$$

Vapor pressure correlation

Assumptions

- Molar holdup H is constant ⇒ $$\frac{dH}{dt} = 0$$

- Constant molal overflow ⇒ $$L_0 = L_1$$ $$V_1 = V_2$$

- Simplification: only use *L* and *V* (no subscripts)