b.) $$L\frac{dI_L}{dt} = (V_g - IR_{on})D + \left(\frac{-V}{n}\right)D' = 0$$

$$0 = V_g D - \frac{nD}{RD'}R_{on}V - \frac{D'}{n}V$$

$$0 = V_g D - V\left(\frac{nD}{RD'}R_{on} + \frac{D'}{n}\right)$$

$$V = \frac{V_g D}{\frac{nDR_{on}}{RD'} + \frac{D'}{n}}$$

$$C\frac{dV_c}{dt} = \left(\frac{-V}{R}\right)D + \left(\frac{I}{n} - \frac{V}{R}\right)D' = 0$$

$$0 = \frac{-V}{R} + \frac{I}{n}D'$$

$$I = \frac{nV}{RD'} = \frac{n}{RD'}\left[\frac{V_g D}{\frac{nDR_{on}}{RD'} + \frac{D'}{n}}\right]$$

c.) $$\dot{\tilde{x}} = A(x-\bar{x}) + B(u-\bar{u})$$

$$A = \frac{\partial f}{\partial \tilde{x}}\Bigg|_{\substack{x=\bar{x},\\ u=\bar{u}}} = \begin{bmatrix} \frac{\partial f_1}{\partial \tilde{i}_L} & \frac{\partial f_1}{\partial \tilde{v}} \\ \frac{\partial f_2}{\partial \tilde{i}_L} & \frac{\partial f_2}{\partial \tilde{v}} \end{bmatrix}\Bigg|_{\substack{i_L = I_L,\ d=D \\ v_c = V_c,\ v_{in}=V_{in}}} = \begin{bmatrix} -\frac{R_{on}D}{L} & \frac{-D'}{nL} \cancel{+\frac{D'}{2n}} \\ \frac{D'}{nC} & \frac{-1}{RC} \end{bmatrix}\Bigg|_{n=2}$$

$$A = \begin{bmatrix} \frac{-R_{on}D}{L} & \frac{-D'}{2L} \\ \frac{D'}{2C} & \frac{-1}{RC} \end{bmatrix}$$