b.) $L\frac{dI_L}{dt} = (V_g - V - 2R_{on}I_L)D + (-V_g - V - 2R_{on}I_L)D' = 0$

$$0 = DV_g - D'V_g - V - \frac{2VR_{on}D}{R} + \frac{2VR_{on}D'}{R}$$

$$0 = (2D-1)V_g - V\left(\frac{2R_{on}}{R} + 1\right)$$

$$0 = (2D-1)V_g - V\left(\frac{2R_{on} + R}{R}\right)$$

$$V = \frac{R(2D-1)V_g}{2R_{on} + R}$$

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

$$0 = I - \frac{V}{R} \rightarrow I = \frac{V}{R} = \frac{(2D-1)V_g}{2R_{on} + R}$$

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

$$A = \left.\frac{\partial f}{\partial \tilde{x}}\right|_{\substack{x=\bar{x},\\ u=\bar{u}}} = \left.\begin{bmatrix} \frac{\partial f_1}{\partial \tilde{i}_L} & \frac{\partial f_1}{\partial \tilde{v}} \\ \frac{\partial f_2}{\partial \tilde{i}_L} & \frac{\partial f_2}{\partial \tilde{v}} \end{bmatrix}\right|_{\substack{i_L = I_L,\ d = D \\ v_c = V_c,\ v_{in} = V_{in}}} = \begin{bmatrix} \frac{-2R_{on}}{L} & \frac{-1}{L} \\ \frac{1}{C} & \frac{-1}{RC} \end{bmatrix}$$

$$B = \left.\frac{\partial f}{\partial \tilde{u}}\right|_{\substack{x=\bar{x},\\ u=\bar{u}}} = \left.\begin{bmatrix} \frac{\partial f_1}{\partial \tilde{d}} & \frac{\partial f_1}{\partial \tilde{v}_g} \\ \frac{\partial f_2}{\partial \tilde{d}} & \frac{\partial f_2}{\partial \tilde{v}_g} \end{bmatrix}\right|_{\substack{i_L = I_L,\ d = D \\ v_c = V_c,\ v_{in} = V_{in}}} = \begin{bmatrix} \frac{2V_g}{L} & \frac{2D-1}{L} \\ 0 & 0 \end{bmatrix}$$