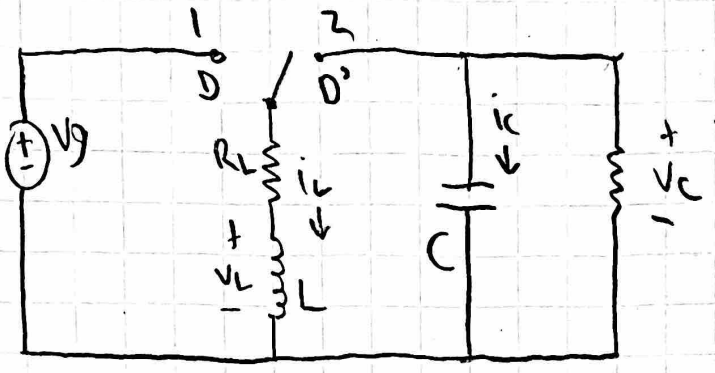
power electronics 1-15-22

3.1, 3.2



pos 1: $v_L = v_g - i_L R_L$, $i_C = -v_C/R$

pos 2: $v_L = v_C - i_L R_L$, $i_C = -v_C/R - i_L$

$$\langle v_L \rangle = D(v_g - i_L R_L) + (1-D)(v_C - i_L R_L) = 0$$

$$Dv_g + v_C - i_L R_L - Dv_C = 0$$

$$Dv_g + (1-D)v_C - i_L R_L = 0$$

$$\langle i_C \rangle = D(-v_C/R) + (1-D)(-v_C/R - i_L) = 0$$

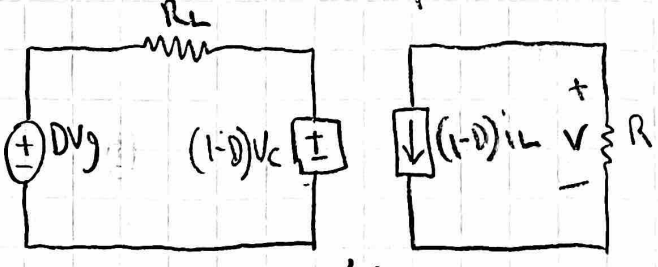
$$-v_C/R - i_L + D i_L = 0$$

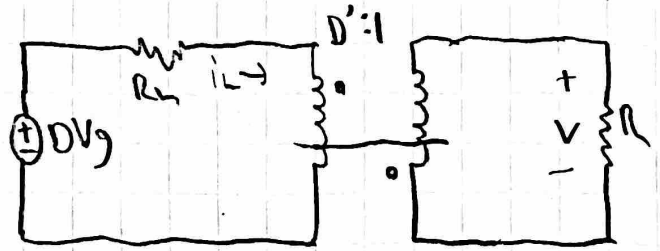
$$-v_C/R - (1-D) i_L = 0 \Rightarrow i_L = \frac{-v_C}{R(1-D)}$$

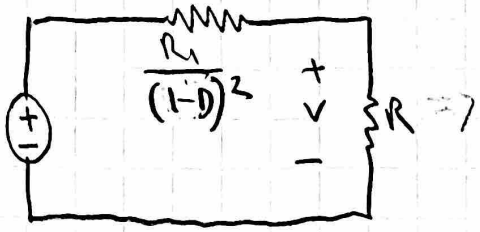
$$Dv_g + (1-D)v_C + \left(\frac{R_L}{R}\right)\left(\frac{v_C}{1-D}\right) = 0$$

$$Dv_g = -v_C\left(1-D + \frac{R_L}{R}\cdot\frac{1}{1-D}\right)$$

$$\frac{v_C}{v_g} = \frac{D}{\left(1-D+\frac{R_L}{R}\cdot\frac{1}{1-D}\right)}$$







$$V = -V_g \frac{D}{1-D} \cdot \frac{R}{R + \frac{R_L}{(1-D)^2}}$$

$$V = -V_g \frac{D}{1-D} \cdot \frac{1}{1 + \frac{R_L/R}{(1-D)^2}}$$

$$\frac{-V_g \cdot D}{1-D}$$