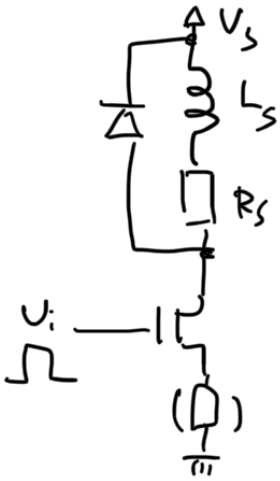

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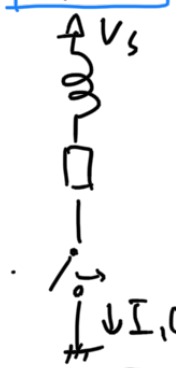
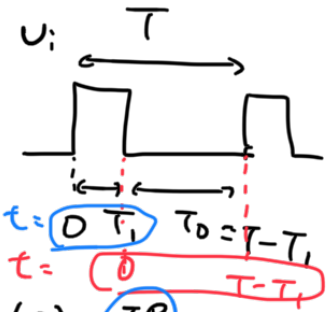


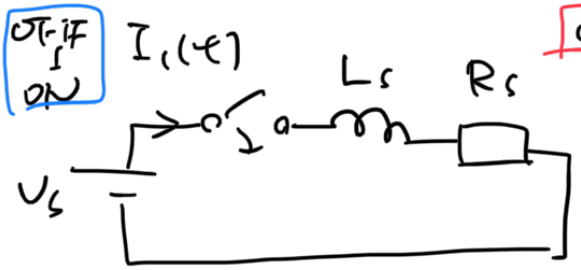
ON→OFF



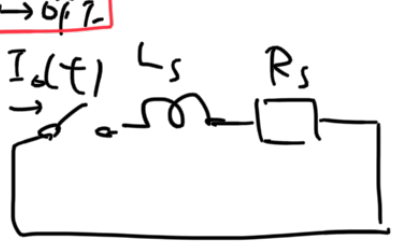
$I_1(0) = I_1^S$ $\quad$ $I_1(T_1) = I_1^e$

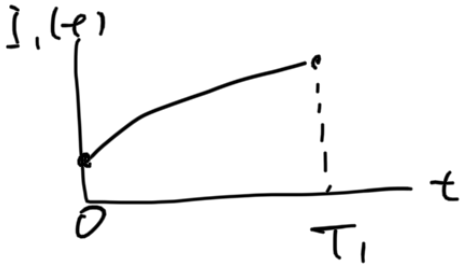
$I_0(0) = I_0^e$ $\quad$ $I_0(T - T_1) = I_0^S$

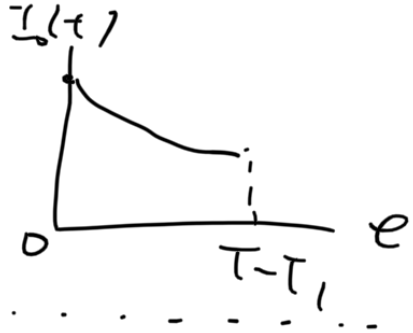
OFF if I_1 ON



ON→OFF







$$L_s \frac{dI_1}{dt} + R_s I_1 = V_s$$

$$L_s \frac{dI_1}{dt} = V_s - R_s I_1$$

$$\frac{dI_1}{dt} = \frac{V_s - R_s I_1}{L_s}$$

$$\frac{dI_1}{V_s - R_s I_1} = \frac{1}{L_s} dt$$

$$\frac{dI_1}{R_s I_1 - V_s} = -\frac{1}{L_s} dt$$

$$\frac{dI_1}{I_1 - \frac{V_s}{R_s}} = -\frac{R_s}{L_s} dt$$

$$\int \frac{dI_1}{I_1 - \frac{V_s}{R_s}} = -\int \frac{R_s}{L_s} dt$$

$$\log \left| I_1 - \frac{V_s}{R_s} \right| + A = \log \left(\frac{V_s}{R_s} - I_1 \right) = -\frac{R_s}{L_s} t + C$$

$$\frac{V_s}{R_s} - I_1 = e^{-\frac{R_s}{L_s} t} \times k$$

$$I_1 = \frac{V_s}{R_s} - k e^{-\frac{R_s}{L_s} t}$$

$$I_1(0) = I_1^S$$

$$I_1(0) = \frac{V_s}{R_s} - k = I_1^S$$

$$k = \frac{V_s}{R_s} - I_1^S$$

$$I_1(t) = \frac{V_s}{R_s} - \left(\frac{V_s}{R_s} - I_1^S \right) e^{-\frac{R_s}{L_s} t}$$

$$I_1(T_1) = I_1^e = \frac{V_s}{R_s} - \left(\frac{V_s}{R_s} - I_1^S \right) e^{-\frac{R_s}{L_s} T_1}$$

$$I_0 = -k' e^{-\frac{R_s}{L_s} t}$$

$$I_0(0) = I_1^e = -k'$$

$$I_0(t) = I_1^e e^{-\frac{R_s}{L_s} t}$$

$$I_0(T - T_1) = I_1^e e^{-\frac{R_s}{L_s}(T - T_1)} = I_1^s$$

$$I_1^e = \frac{V_s}{R_s} - \left(\frac{V_s}{R_s} - I_1^s\right) e^{-\frac{R_s}{L_s} T_1}$$

$$= \frac{V_s}{R_s} - \left(\frac{V_s}{R_s} - I_1^e e^{-\frac{R_s}{L_s}(T - T_1)}\right) e^{-\frac{R_s}{L_s} T_1}$$

$$= \frac{V_s}{R_s} - \frac{V_s}{R_s} e^{-\frac{R_s}{L_s} T_1} + I_1^e e^{-\frac{R_s}{L_s}(T - T_1)} e^{-\frac{R_s}{L_s} T_1}$$

$$= \frac{V_s}{R_s}\left(1 - e^{-\frac{R_s}{L_s} T_1}\right) + I_1^e e^{-\frac{R_s}{L_s} T}$$

$$I_1^e = \frac{1 - e^{-\frac{R_s}{L_s} T_1}}{1 - e^{-\frac{R_s}{L_s} T}} \frac{V_s}{R_s}, \qquad I_1^s = I_1^e \cdot e^{-\frac{R_s}{L_s}(T - T_1)}$$