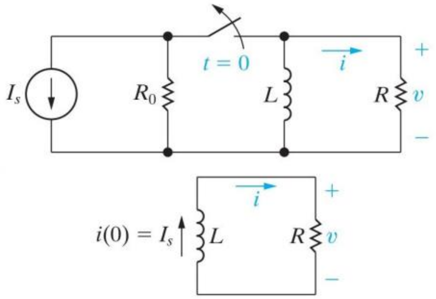
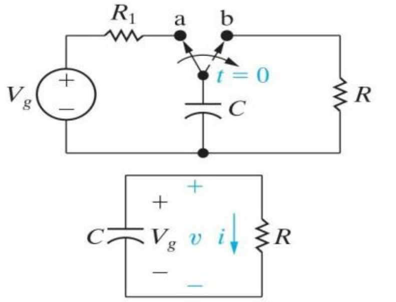
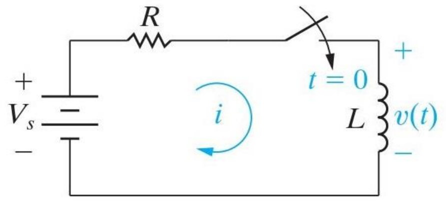
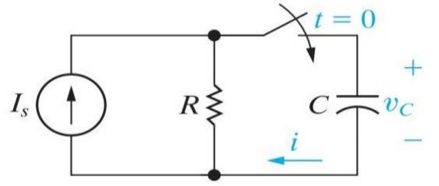
Response of RL/RC circuit

Natural response		Step response	
			
$i_L(t) = i(0)e^{-t/\tau}, \tau = L/R$ Power: $p = I_s^2 R e^{-2t/\tau}$ Energy: $E = \frac{1}{2} L I_s^2 (1 - e^{-2t/\tau})$ Total Energy: $E_t = \frac{1}{2} L I_s^2$	$v_C(t) = v(0)e^{-t/\tau}, \tau = RC$ Power: $p = \frac{V_g^2}{R} e^{-2t/\tau}$ Energy: $E = \frac{1}{2} C V_g^2 (1 - e^{-2t/\tau})$ Total Energy: $E_t = \frac{1}{2} C V_g^2$	$\tau = L/R$ $i_L(t) = \frac{V_s}{R} + \left(I_0 - \frac{V_s}{R}\right) e^{-t/\tau}$ $v_L(t) = (V_s - I_0 R) e^{-t/\tau}$	$\tau = RC$ $v_C(t) = I_s R + (V_0 - I_s R) e^{-t/\tau}$ $i_C(t) = \left(I_s - \frac{V_0}{R}\right) e^{-t/\tau}$

Note that:

+ For inductor:

$$v_L(t) = L\frac{di_L}{dt} \leftrightarrow i_L(t) = \frac{1}{L}\int_{t_0}^{t} v_L(\tau)\,d\tau + i_L(t_0)$$

+ Parallel inductor:

$$L_{eq} = \frac{L_1 L_2}{L_1 + L_2}$$

+ Series inductor:

$$L_{eq} = L_1 + L_2$$

+ For capacitor:

$$i_C(t) = C\frac{dv_C}{dt} \leftrightarrow v_C(t) = \frac{1}{C}\int_{t_0}^{t} i_C(\tau)\,d\tau + v_C(t_0)$$

+ Parallel capacitor:

$$C_{eq} = C_1 + C_2$$

+ Series capacitor:

$$C_{eq} = \frac{C_1 C_2}{C_1 + C_2}$$