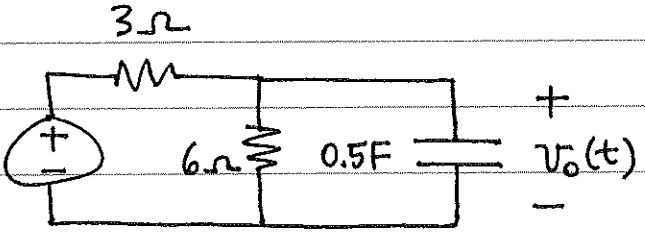
EE 261
FALL 2011
A. INAN

HW #7
P# 1
(six pages)

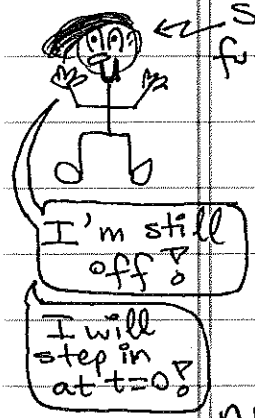
SOLUTIONS TO HOMEWORK #7

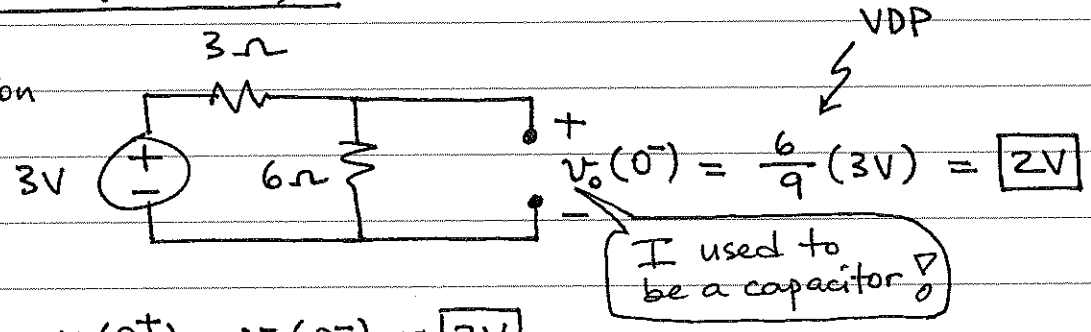
p. 359

P 8.6-2



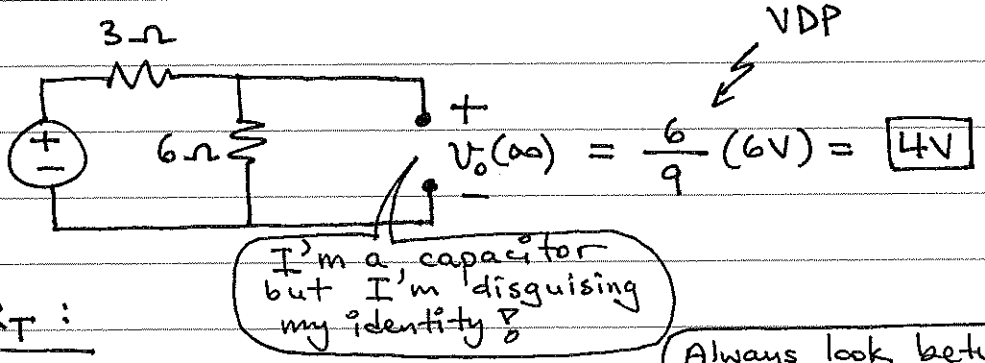
At $t = 0^-$ (SS holds):



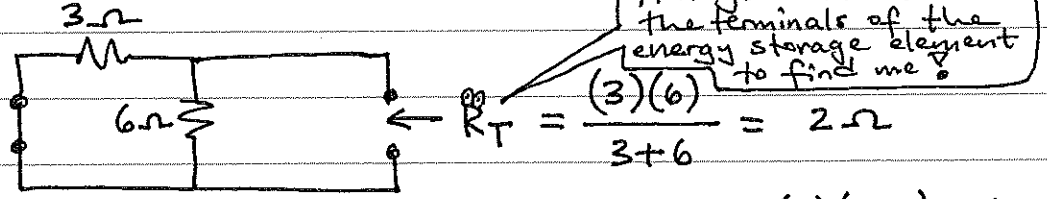


$\therefore v_o(0^+) = v_o(0^-) = \boxed{2V}$

At $t = \infty$ (SS holds):



To find R_T:



$\therefore \tau = R_T C = (2)(0.5) = 1$ sec

$$\therefore v_o(t) = 2e^{-t} + 4(1 - e^{-t}) = 4 - 2e^{-t} \text{ (V)}$$

(either is acceptable)

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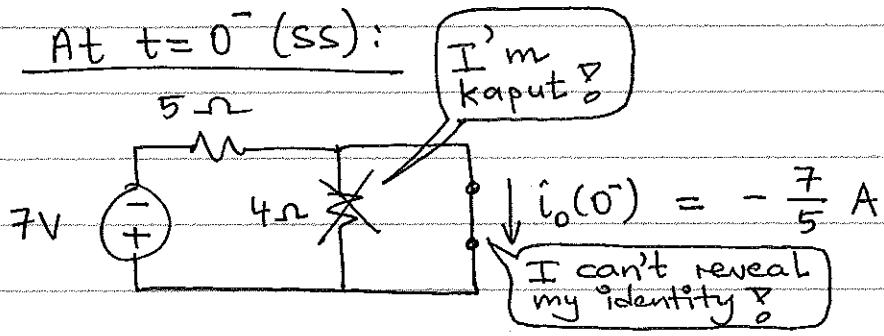
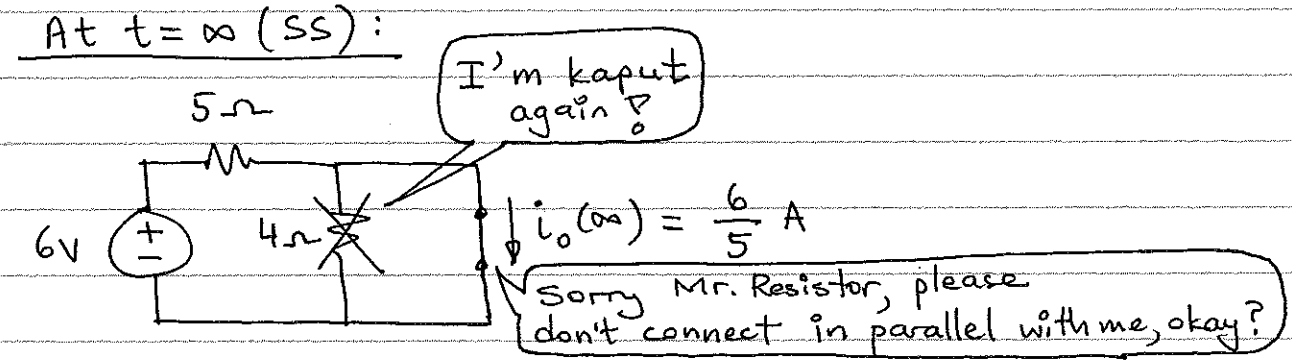
P 8.6-3

At $t = 0^-$ (ss):



$\therefore\ i_o(0^+) = i_o(0^-) = -\frac{7}{5}$ A

At $t = \infty$ (ss):



$$\tau = \frac{L}{R_T} = \frac{1.2}{5//4} = \frac{1.2}{\left[\frac{(5)(4)}{9}\right]} = \frac{10.8}{20} = \frac{27}{50}$$

$$\therefore\ i_o(t) = -\frac{7}{5}e^{-50t/27} + \frac{6}{5}\left(1 - e^{-50t/27}\right)$$

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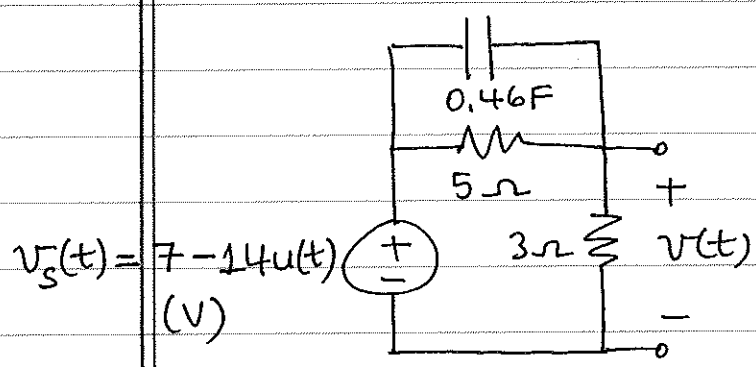
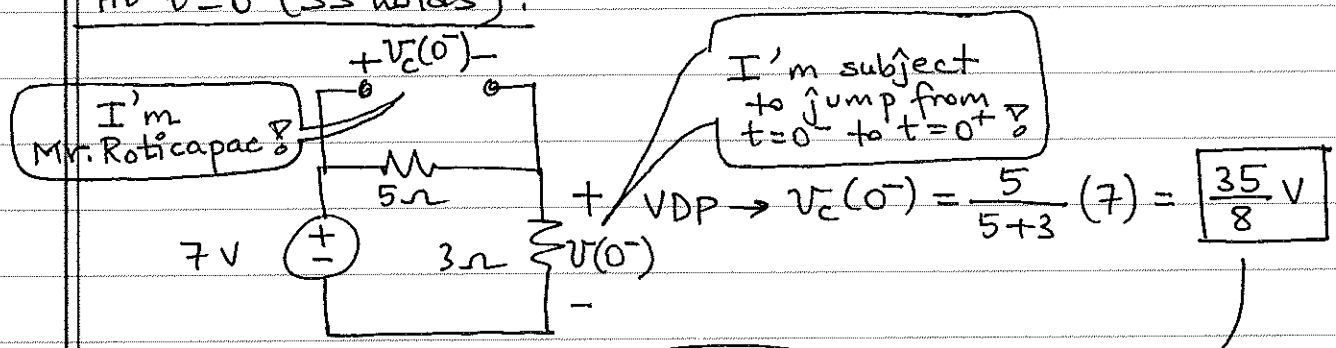
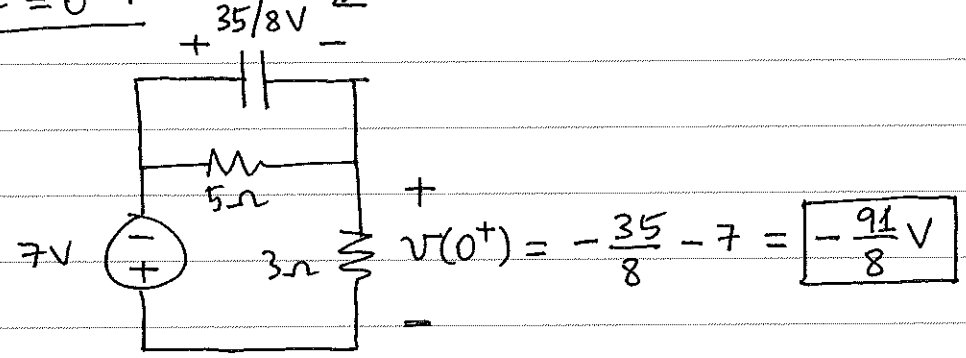
P 8.6-9



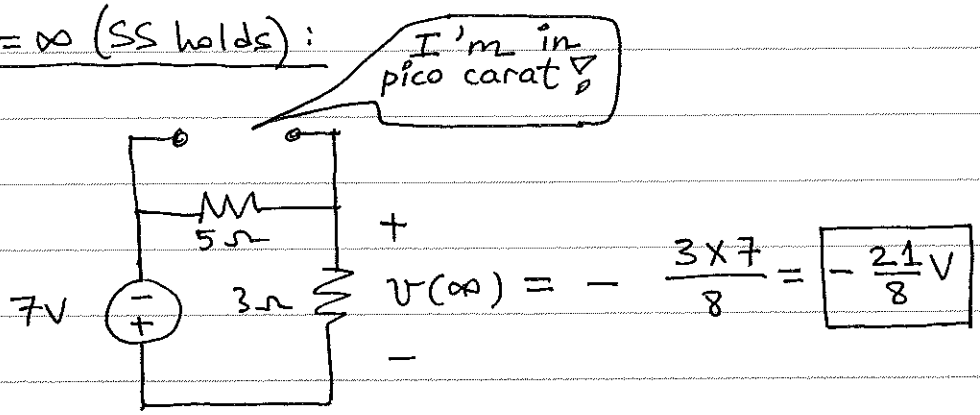
At $t = 0^-$ (SS holds):



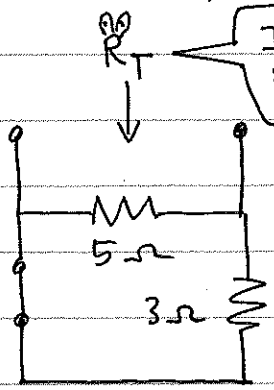
At $t = 0^+$:



At $t = \infty$ (SS holds):



$\tau = R_T C$ where R_T can be found as follows:



$$R_T = \frac{5 \times 3}{8} = \frac{15}{8}\ \Omega$$

$$\tau = \frac{15}{8}(0.46) = \frac{345}{400} = \frac{69}{80}$$

$$\therefore v(t) = -\frac{91}{8}e^{-80t/69} + \left(-\frac{21}{8}\right)\left(1 - e^{-80t/69}\right)$$

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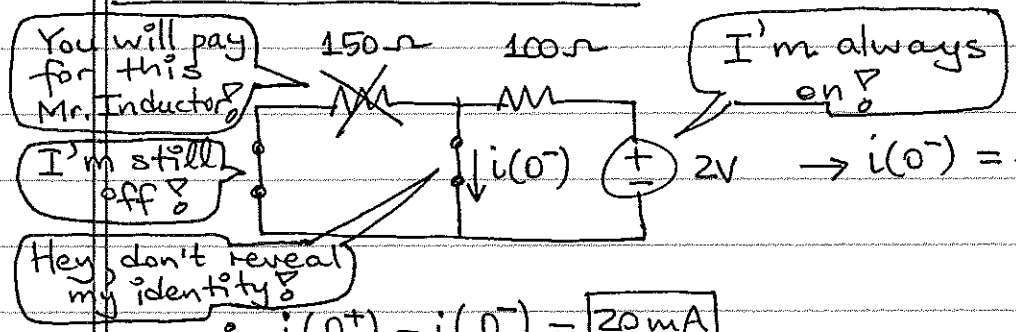
P 8.6-14

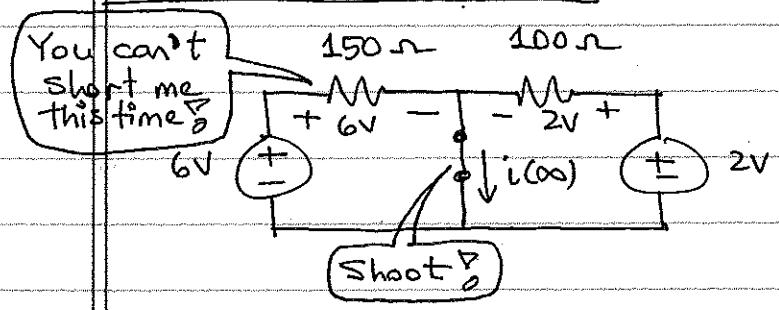
At $t=0^-$ (SS holds):



$\rightarrow i(0^-) = \frac{2}{100} = 20\,mA$

$\therefore i(0^+) = i(0^-) = \boxed{20\,mA}$

At $t=\infty$ (SS holds):



$\therefore i(\infty) = \frac{6V}{150\Omega} + \frac{2V}{100\Omega}$

$= 0.04 + 0.02$

$= \boxed{60\,mA}$

$\tau = \frac{L}{R_T} = \frac{2}{150 // 100} = \frac{2(150+100)}{150 \times 100} = \frac{1}{30}\ sec$

$$\therefore i(t) = 20e^{-30t} + 60(1-e^{-30t})\ (mA)$$

p.362

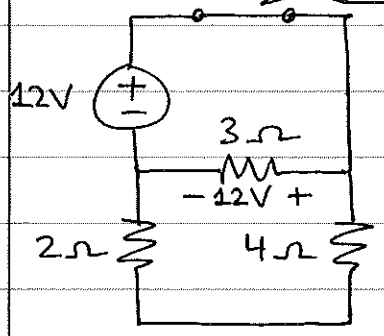
P 8.6-26

$v(0^+) = 0.$ ← No energy stored in the circuit to produce any voltage or current.

At $t = \infty$ (SS holds) :

My energy reached its final value?

Now I can take the rest of the day off !



VDP

$$v(\infty) = \frac{4}{2+4}(12) = \boxed{8V}$$

$$\tau = \frac{L}{R_T} = \frac{0.5}{3//6} = \frac{0.5}{2} = 0.25 \text{ sec}$$

$$\therefore\ v(t) = 8\left(1 - e^{-4t}\right)\ (V)$$

THE END