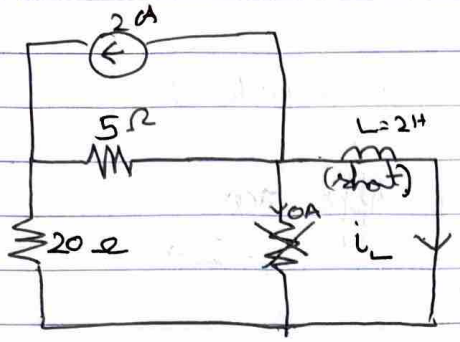
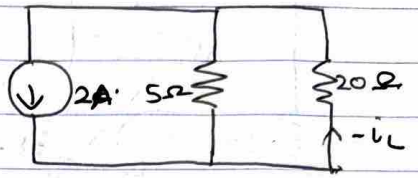
P 8.3-14



Step 1: find $i(0^+)$

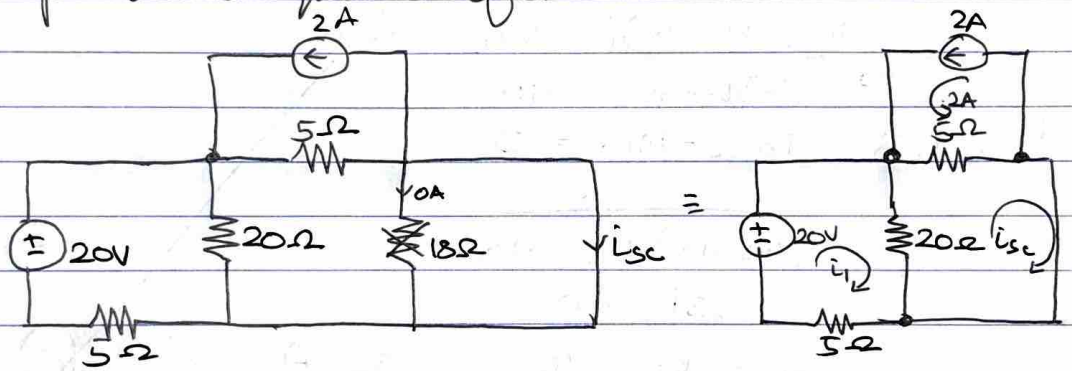
$\equiv$



Apply current division: $i_L(0^-) = -\left(\frac{5}{20+5}\right)2A = -\frac{2}{5}A$

$\therefore i(0^+) = i(0^-) = -2/5\,A$ —①

Step 2: Norton equivalent of ckt:



Apply MCA:

$20(i_1 - i_{sc}) + 5i_1 = 20 \Rightarrow 25i_1 - 20i_{sc} = 20$

$\Rightarrow 5i_1 - 4i_{sc} = 4$ —②

$20(i_{sc} - i_1) + 5(i_{sc} + 2) = 0$

$\Rightarrow 20i_{sc} + 5i_{sc} - 20i_1 = -10$

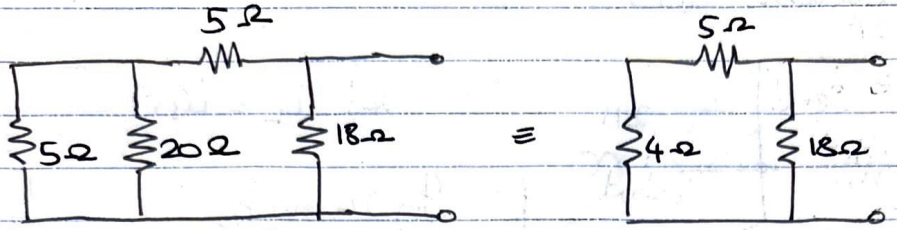
$\Rightarrow 20i_1 - 25i_{sc} = 10$

$\Rightarrow 4i_1 - 5i_{sc} = 2$ — ③

Solve ②, ③:

$$i_{sc} = \frac{2}{3}\,A$$

For R_t,

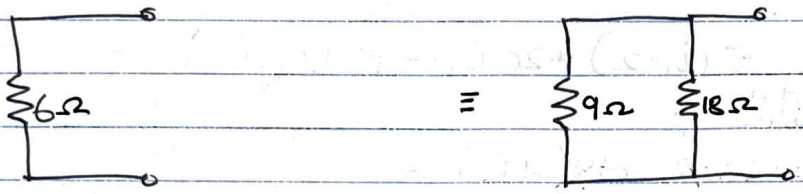


$20/4 = 5$

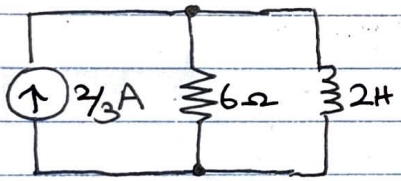
$20/5 = 4$

III

$18/3 = 6$



$\therefore R_t = 6\Omega$



Step 3: substitute formula

$$i(t) = I_{sc} + (i(0^+) - I_{sc})e^{-t(R_t/L)}$$

$$\therefore i(t) = \frac{2}{3} + \left(\frac{-2}{5} - \frac{2}{3}\right)e^{-t(6/2)}$$

$$= \frac{2}{3} + (-2)\left(\frac{8}{15}\right)e^{-3t} = \frac{2}{3} - \frac{16}{15}e^{-3t}$$

$$\therefore i(t) = \frac{2}{3} - \frac{16}{15}e^{-3t} \qquad t \geq 0$$