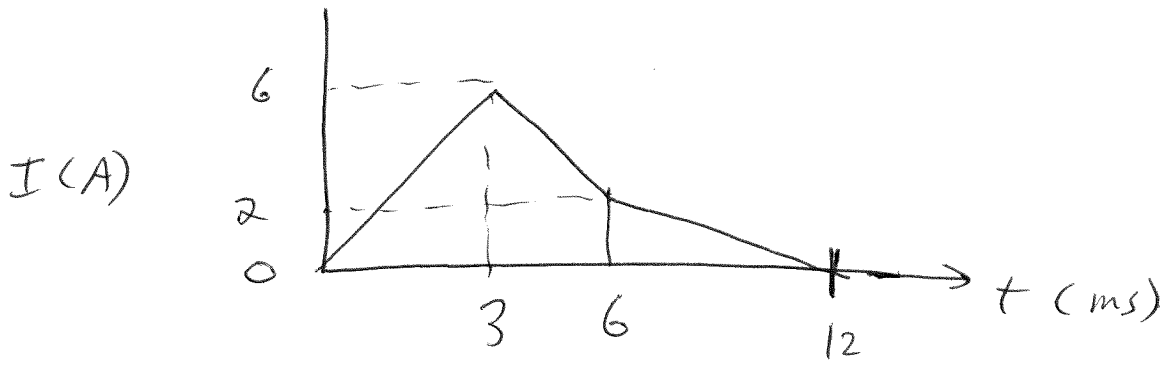
Ch. 14 Prob. 42

$L = 5.0\ mH$

$R = 5.0\ \Omega$



$$\mathcal{E} = -L\frac{dI}{dt}$$

from $t = 0 - 3\ ms$

$$\mathcal{E} = -(5.0\times10^{-3}\ H)\left(\frac{6A - 0A}{3\times10^{-3}\ s - 0}\right) = -10\ V$$

at $t = 2.0\ ms$ $\quad I = 4.0\ A$

so $V = I\cdot R = (4.0A)(5.0\Omega) = 20V$

$\therefore\ V_{tot} = \mathcal{E} + V = -10 + 20 = \boxed{10V}$

from $t = 3 - 6\ ms$

$$\mathcal{E} = -(5.0\times10^{-3}\ H)\left(\frac{3A - 6A}{6\times10^{-3}\ s - 3\times10^{-3}\ s}\right) = 3.00\ V$$

at $t = 4.0\ ms$ $\quad I = 5.0\ A$

so $V = I\cdot R = (5.0A)(5.0\Omega) = 25V$

$\therefore\ V_{tot} = 3.00 + 25 = \boxed{28V}$

from $t = 6\ ms - 12\ ms$

$$\mathcal{E} = -(5.0\times10^{-3}\ H)\left(\frac{0A - 3A}{12\times10^{-3} - 6\times10^{-3}}\right) = \boxed{2.5\ V}$$

at $t = 8\ ms$ $\quad I = 2A$

so $V = I\cdot R = (2A)(5.0\Omega) = 10V$

$\therefore\ V_{TOT} = 2.5V + 10V = \boxed{12.5V}$