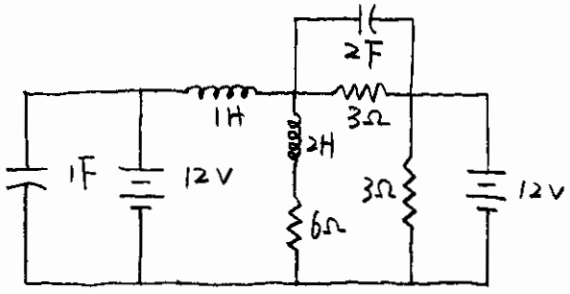
4.11



$V_{1F} = 12\ V$

$W_{1F} = \frac{1}{2} C_{1F} V_{1F}^2 = \frac{1}{2} \times 1 \times 12^2 = 72\ J$

$i_{1H} = i_{6\Omega} = \frac{12}{6} = 2\ A$

$W_{1H} = \frac{1}{2} L_{1H} i_{1H}^2 = \frac{1}{2} \times 1 \times 2^2 = 2\ J$

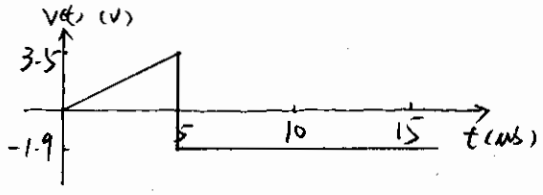
$i_{2H} = i_{6\Omega} = \frac{12}{6} = 2\ A$

$W_{2H} = \frac{1}{2} L_{2H} i_{2H}^2 = \frac{1}{2} \times 2 \times 2^2 = 4\ J$

$V_{2F} = 0\ V$

$W_{2F} = 0\ J$

4.14



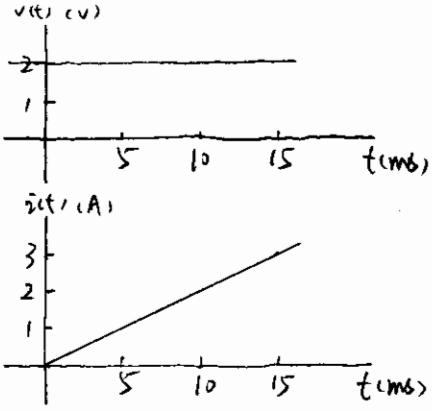
$$i_L = \frac{1}{L} \int_0^t v_L(t)\,dt + i_L(0)$$

$t = 15$ ms, assume $i_L(0) = 0$

$$i_L = \frac{1}{0.75 \times 10^{-3}} \int_0^{5\times10^{-6}} \frac{3.5\,t}{5\times10^{-6}}\,dt + \frac{1}{0.75\times10^{-3}} \int_{5\times10^{-6}}^{15\times10^{-6}} (-1.9)\,dt$$

$$= \frac{1}{0.75\times10^{-3}} \cdot \frac{1}{2} \cdot \frac{3.5\,t^2}{5\times10^{-6}} \Big|_0^{5\times10^{-6}} + \frac{1}{0.75\times10^{-3}} (-1.9t) \Big|_{5\times10^{-6}}^{15\times10^{-6}} = -13.67\ mA$$

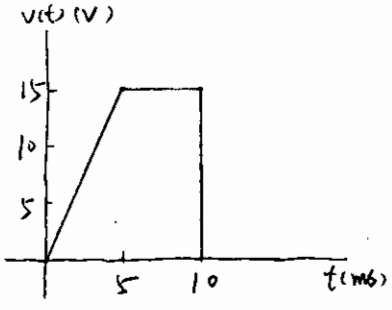
4.19

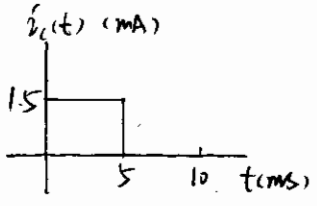


$$V_L = L \frac{di_L(t)}{dt}$$

$$L = \frac{V_L}{\frac{di_L(t)}{dt}} = \frac{2}{\frac{d(\frac{3}{15\times10^{-3}}t)}{dt}} = \frac{2}{\frac{3}{15\times10^{-3}}} = 10\ mH$$

4.20

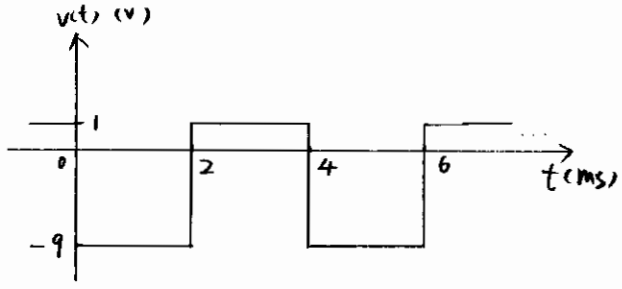




$$i_C = C \frac{dv_c(t)}{dt}$$

$$C = \frac{i_C}{\frac{dv_c(t)}{dt}} = \frac{1.5\times10^{-3}}{\frac{d(\frac{15}{5\times10^{-3}}t)}{dt}} = \frac{1.5\times10^{-3}}{\frac{15}{5\times10^{-3}}} = 0.5\ pF$$

4.25



$$V_{ave} = \frac{1}{2}(1-9) = -4\ V$$

$$V_{rms} = \sqrt{\frac{1}{4\times10^{-3}}\left[\int_0^{2\times10^{-3}} (-9)^2\,dt + \int_{2\times10^{-3}}^{4\times10^{-3}} (1)^2\,dt\right]}$$

$$= \sqrt{\frac{1}{4\times10^{-3}}\left[81t\Big|_0^{2\times10^{-3}} + t\Big|_{2\times10^{-3}}^{4\times10^{-3}}\right]}$$

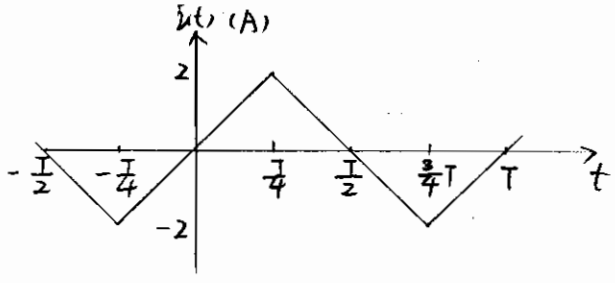
$$= \sqrt{\frac{1}{2}(81+1)}$$

$$= \sqrt{41}$$

$$= 6.40\ V$$

$$\frac{V_{ave}}{V_{rms}} = \frac{-4}{6.40} = -0.625$$

4.28



$$i_{rms} = \sqrt{\frac{1}{\frac{T}{4}}\int_0^{\frac{T}{4}} \left(\frac{2}{\frac{T}{4}}t\right)^2 dt}$$

$$= \sqrt{\frac{4}{T}\int_0^{\frac{T}{4}} \left(\frac{8}{T}t\right)^2 dt}$$

$$= \sqrt{\frac{4}{T}\left(\frac{64}{T^2}\cdot\frac{t^3}{3}\right)\Big|_0^{\frac{T}{4}}}$$

$$= \sqrt{\frac{4\times64}{T^3}\frac{T^3}{3\times4^3}}$$

$$= \sqrt{\frac{4}{3}}$$

$$= \frac{2}{\sqrt{3}}\ A$$