$E = \frac{1}{2} C V^2$

$V(t) = \frac{40mA}{200 \cdot 10^{-9}} (100ns - 0) + 10V$

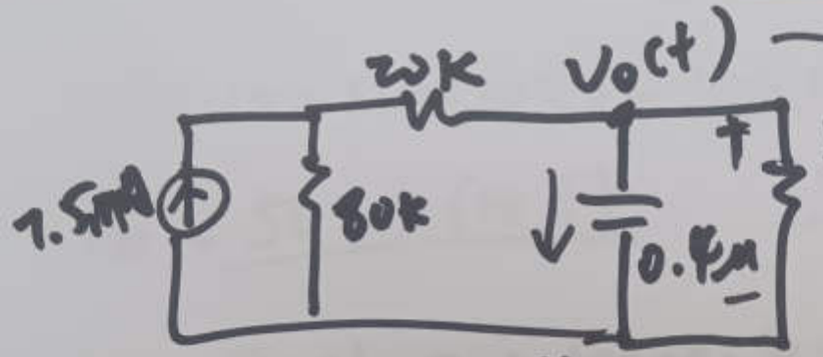
t

↑

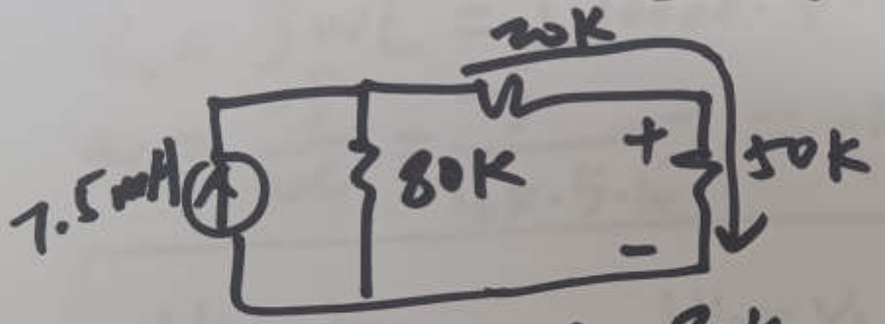
$0 < t < 100ns$

$V(t) = \frac{80mA}{200 \cdot 10^{-9}} (300ns - 100ns) + V(100ns)$

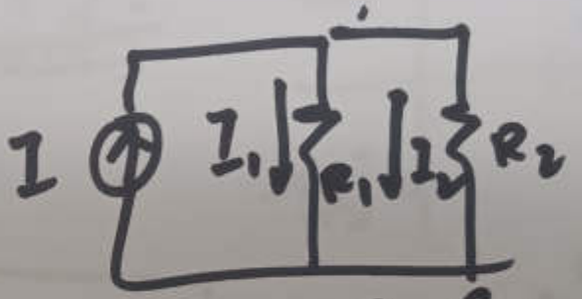
$100ns < t < 300ns$



$$V(t) = V_0(t) \cdot e^{-t/\tau c}$$



$$V_0(t) = \frac{7.5\,mH \cdot 80K}{150K} \cdot 50K$$



$$I_1 = \frac{I \cdot R_2}{R_1 + R_2}$$

$$I_2 = \frac{I \cdot I_1}{R_1 + R_2}$$

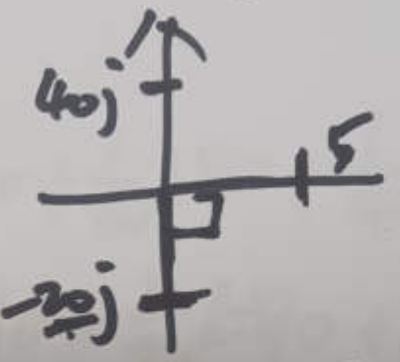
$V_a = 100\sin(\omega t) = 100\cos(\omega t - 90^\circ)$

$100\angle -90$

$V_b = 50\cos(\omega t)$

$5\angle 0^\circ$

$Z_L = j\omega L = j \cdot 10000 \cdot 4 \cdot 10^{-3} = 40j$



$Z_C = \frac{-j}{\omega C} = \frac{-j}{10K \cdot 5 \cdot 10^{-6}} = -20j$

$20\angle -90^\circ$

$$\frac{V_a - V_1}{40j} + \frac{V_b - V_1}{-20j} = \frac{V_1}{40}$$

$$\frac{100\angle -90^\circ - V_1}{40\angle 90^\circ} + \frac{50\angle 0^\circ - V_1}{20\angle -90^\circ} = \frac{V_1}{40}$$

$$\frac{100\angle -90}{40\angle 90} - \frac{V_1\angle 0}{40\angle 90^\circ} + \frac{50\angle 0}{20\angle -90} - \frac{V_1\angle 0}{20\angle -90} = \frac{V_1}{40}$$

(3)

$$2.5\angle -180^\circ - \frac{V_1}{40}\angle -90^\circ + 2.5\angle 90^\circ$$

$$-\frac{V_1}{20}\angle 90^\circ = \frac{V_1}{40}$$

$$2.5\angle -180^\circ + 2.5\angle 90^\circ = V_1\left(\frac{1}{40}\angle -90 + \frac{1}{20}\angle 90 + \frac{1}{40}\right)$$

$$= V_1\left(\frac{1}{40}\angle -90 - \frac{1}{20}\angle -90 + \frac{1}{40}\right)$$

$$2.5\angle -180 + 2.5\angle 90 = V_1\left(\frac{1}{40}\angle 90 + \frac{1}{40}\right)\frac{1}{40}$$

$$3.5\angle 135 = \frac{V_1}{40}\cdot 1.41\cdot\angle 45^\circ$$

$$V_1 = 3.5\angle 135\cdot\frac{1.41}{40}\angle 45^\circ$$

$$= 0.12\cdot\angle 180$$

$$= 0.12(\cos 180 + j\sin 180)$$

$$= 0.12(-1 + 0) = -0.12$$

④

$$\frac{-100j - V_1}{40j} + \frac{50 - V_1}{-20j} = \frac{V_1}{40}$$

$\times 40j$:

$$-100j - V_1 - 2(50 - V_1) = V_1 j$$

$$-100j - V_1 - 100 + 2V_1 = V_1 j$$

$$-100j - 100 + V_1 = -V_1 + V_1 j$$

$$-100j - 100 = V_1 (j - 1)$$

$$V_1 = \frac{-100j - 100}{j - 1}$$

$-1 - 1$

100

-2

(5)

$$V_1 = 100\,\frac{j+1}{1-j}$$

$$= 100\,\frac{(j+1)(1+j)}{2}$$

$$= 50\cdot(-1+1+2j)$$

$$= 100j$$

$$V_b = \frac{V_b - 100j}{-20j} = \frac{50-100j}{-20j} = \frac{50j+100}{20}$$

$$= 5 + 2.5j$$

$$\sqrt{5^2+2.5^2}\cdot\cos\left(\omega t + \arctan\frac{2.5}{5}\right)$$

(b)