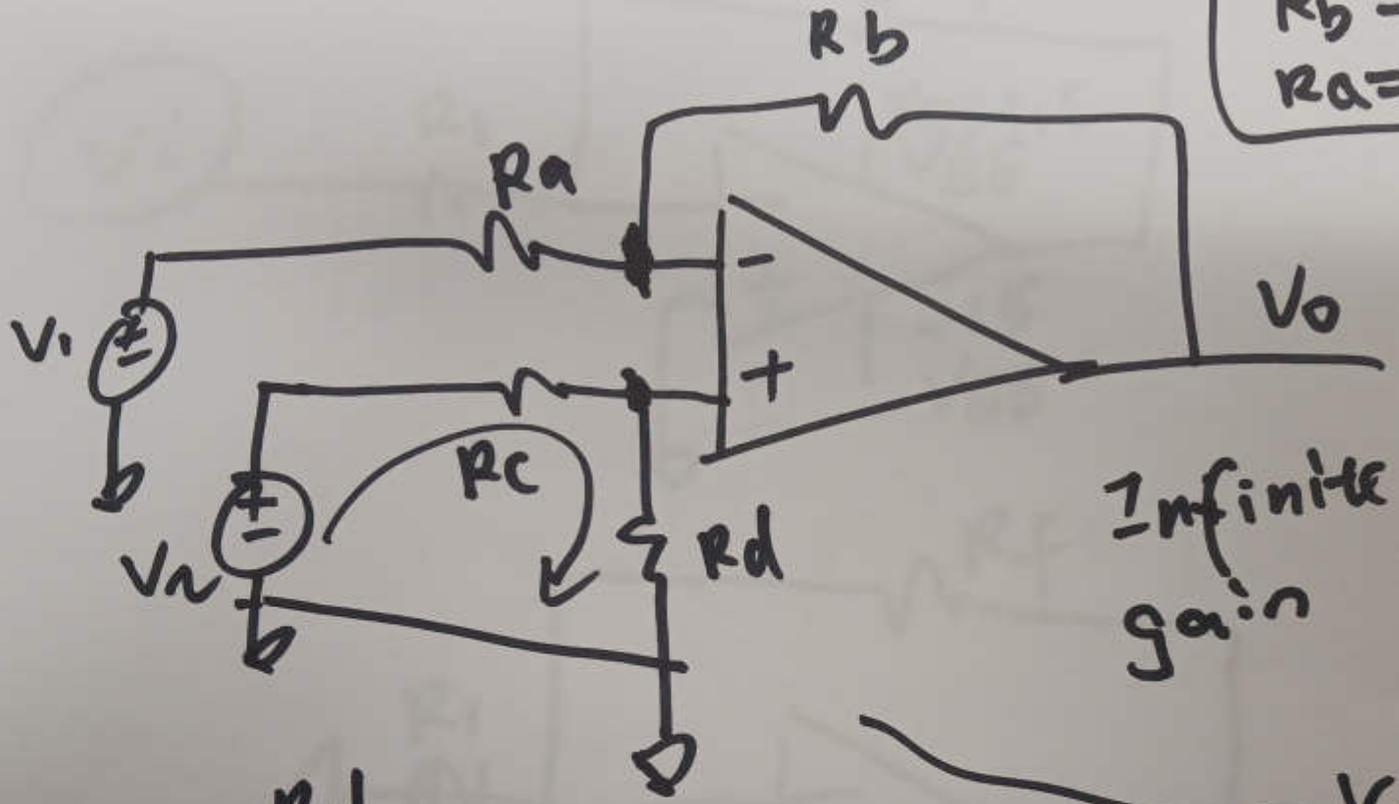
$R_b = R_d$
$R_a = R_c$

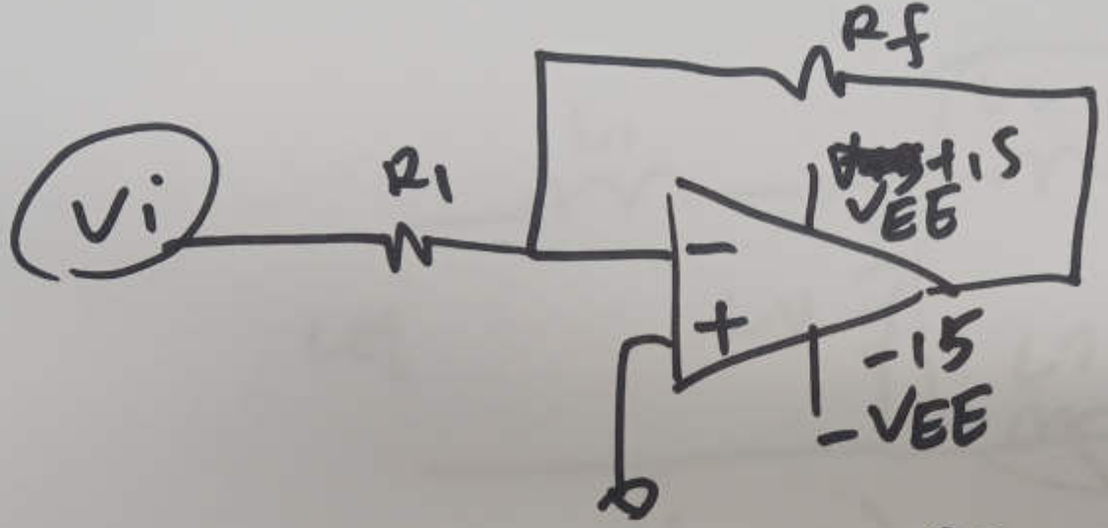


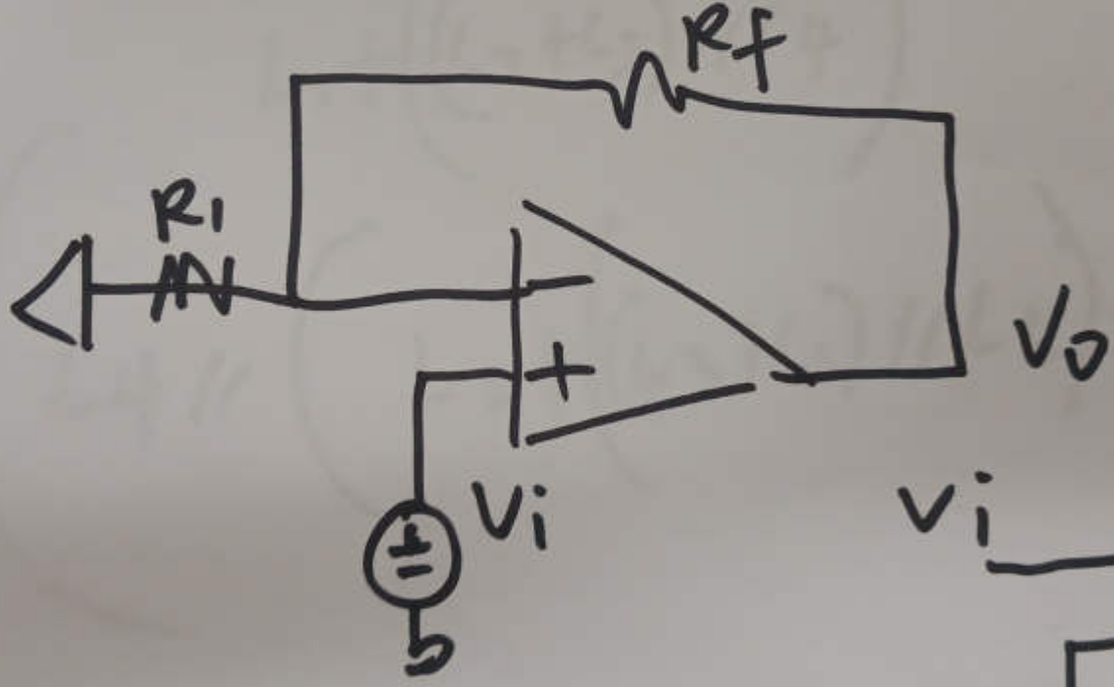
ideal
↓
Infinite gain
Open loop + negative feedback
↓
$V_c = V_f$

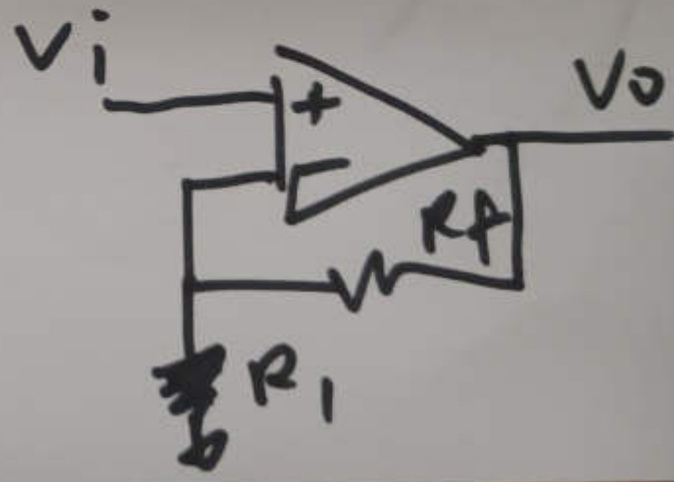
$$V_2 \cdot \frac{R_d}{R_c + R_d}$$

$$\frac{V_1 - V_2 \frac{R_d}{R_c + R_d}}{R_a} = \frac{V_2 \frac{R_d}{R_c + R_d} - V_o}{R_b}$$

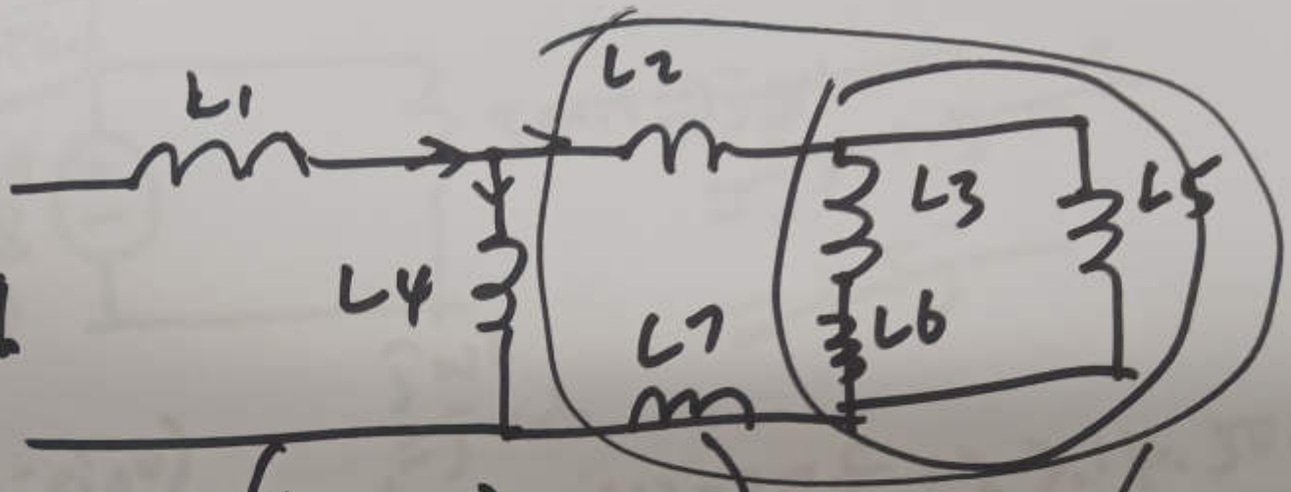
D







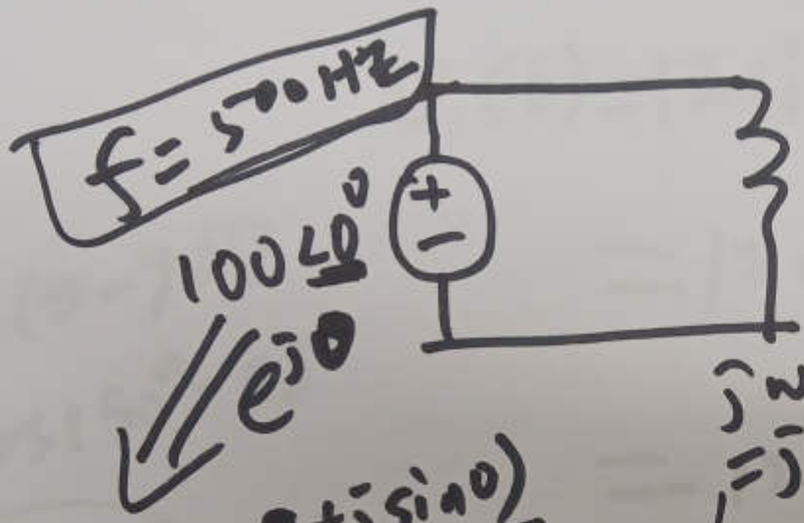
(2)



$$L_1 + \left((L_2 + L_3) \parallel L_4\right)$$

$$L_1 + \left(L_4 \parallel \left(L_2 + \left((L_3 + L_6) \parallel L_5\right) + L_7 \right) \right)$$

(B)



$100\angle 0^\circ = 100 e^{j0}$

$= 100(\cos 0 + j \sin 0)$

$= 100\,V$

$j\omega L = j \cdot \omega L$

$\omega = 2\pi f = 2 \cdot 3.14 \cdot 500 = 3140$

$= j \cdot 3140 \cdot 3 \times 10^{-3}\ \Omega$

$= j\,9.42\ \Omega$

$a + bj$

$$I = \frac{V}{Z_L} = \frac{100\angle 0^\circ}{j9.42} = \frac{100\angle 0^\circ}{9.42\angle 90^\circ} = 10.62 \cdot \angle -90^\circ$$

$= -10.62j$

-90°

(4)

$$v_1(t) = 12\sin(377t + 35^\circ)$$

$$= 12\cos(377t + 35^\circ - 90^\circ)$$

$$= 12\cos(377t - 55^\circ)$$

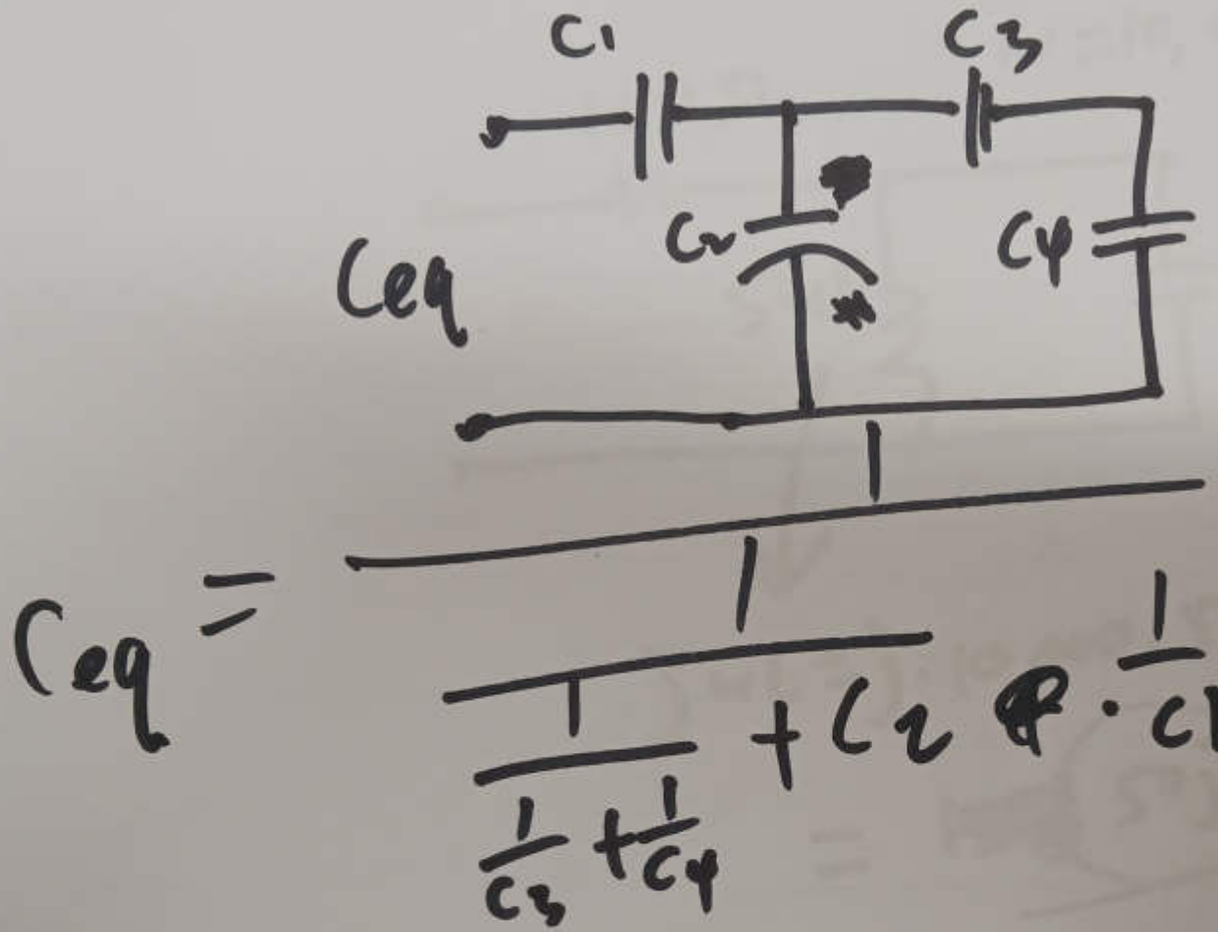
$\cos(\theta - 90^\circ)$
$= \cos(90^\circ - \theta)$

$12\angle -55^\circ$
$\Downarrow$
$12e^{-j55^\circ}$

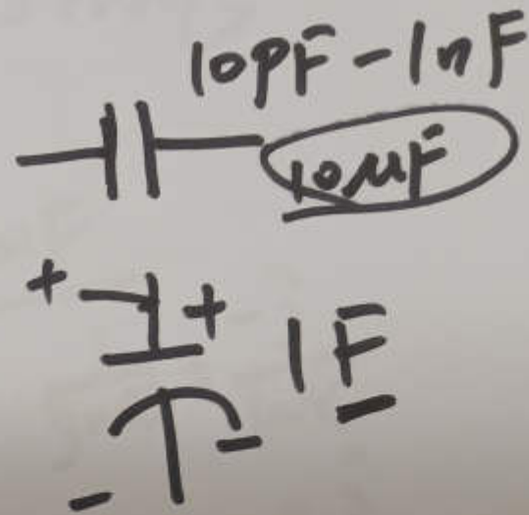
! Euler's

$$12(\cos 55^\circ - j\sin 55^\circ)$$

(5)

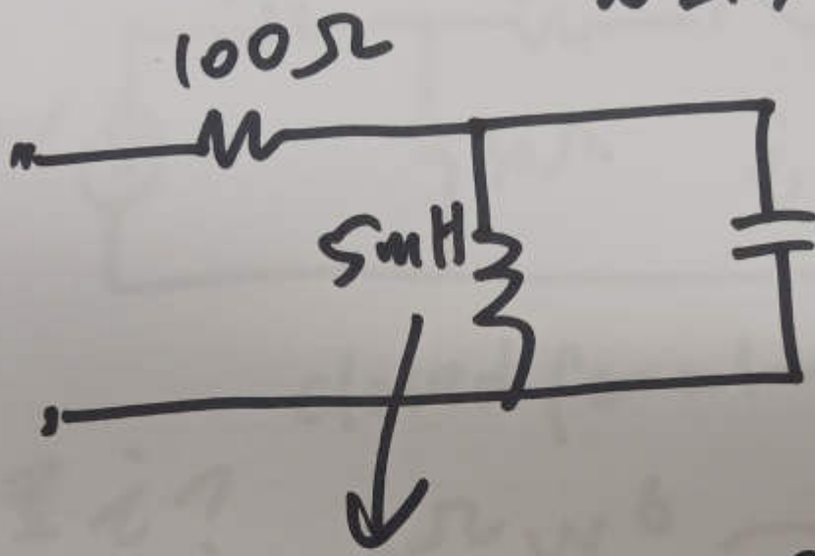


$$C_{eq} = \frac{1}{\frac{1}{\frac{1}{C_3}+\frac{1}{C_4}} + C_2} \cdot C_1$$



(6)

$\omega = 10{,}000$ rad/s



$\frac{1}{j\omega C} = \frac{-j}{\omega C}$

$= \frac{-j}{10{,}000 \cdot 1 \cdot 10^{-6}}$

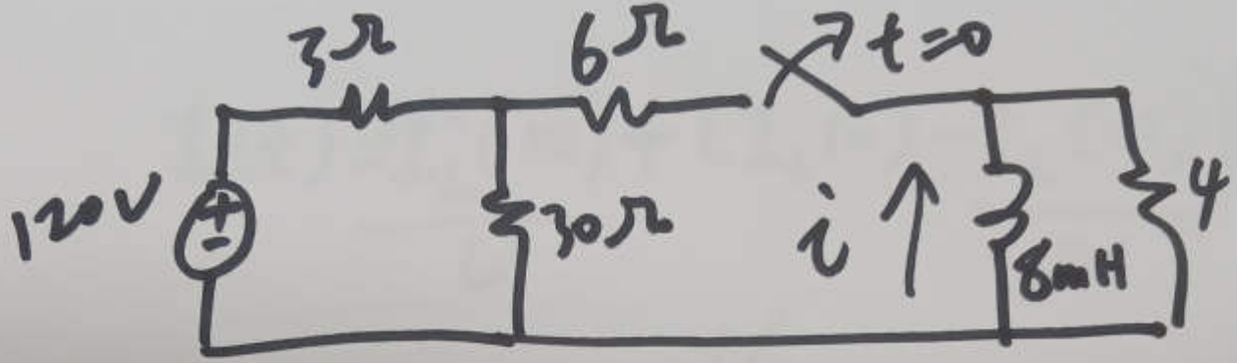
$j\omega L = j \cdot 10{,}000 \cdot 5 \cdot 10^{-3}$

$= 50j$

$= -j100$

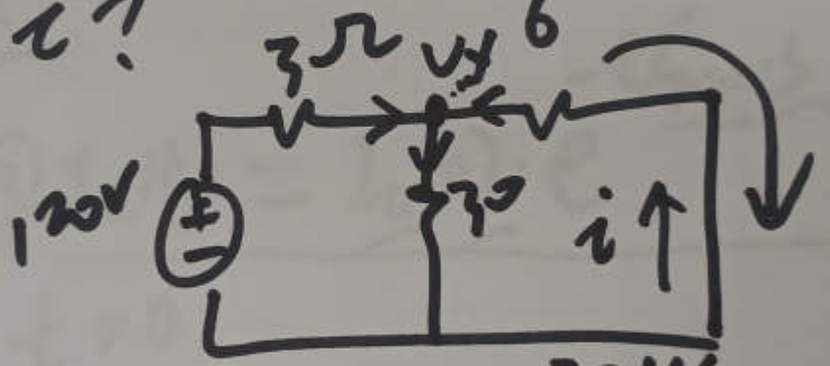
$Z_{eq} = 100\Omega + (50j \,//\, (-100j))$

(2)



closed for a long time

① 求 i?



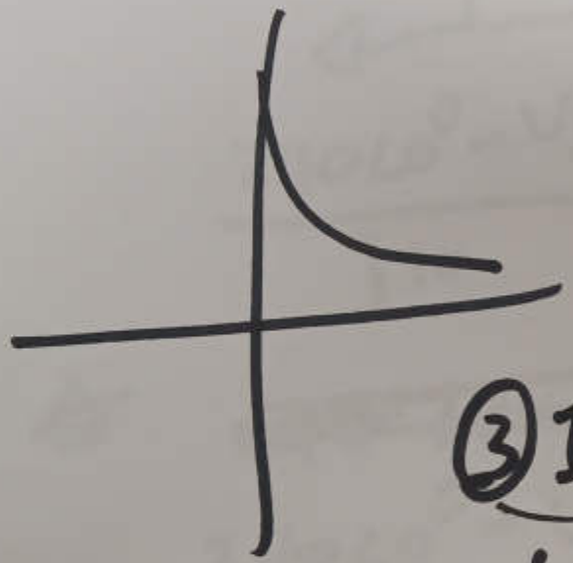
$$\frac{120-V_x}{3}+i=\frac{V_x}{30}$$

$$i=-\frac{120V\cdot\frac{30\|6}{3+(30\|6)}}{6}$$

② Time constant $t>0$, $\tau=\frac{L}{R}=\frac{8\cdot10^{-3}}{4}=2ms$

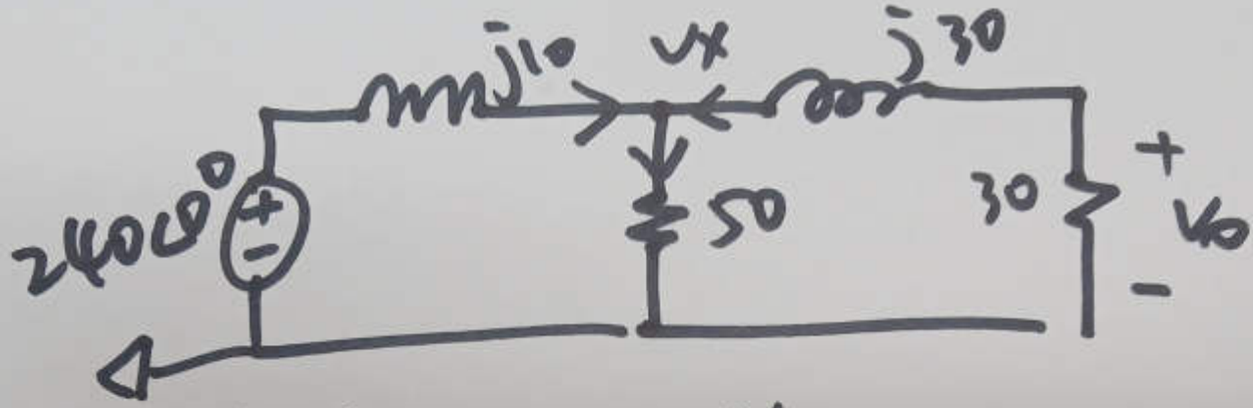
$$I_L(t) = \underbrace{I_L(\infty)}_{0} + \left(I_L(0) - \underbrace{I_L(\infty)}_{0}\right) e^{-t/\tau}$$

$$= I_L(0) e^{-t/\tau}$$



③ $I_L(t) = I_L(0) \cdot e^{-t/\text{some } \tau}$

$t > 0.$



$$\frac{240\angle 0^\circ - V_x}{j10} + \frac{0 - V_x}{30+j30} = \frac{V_x}{50}$$

$$\frac{240\angle 0^\circ - V_x}{10\angle 90^\circ} + \frac{-V_x + 0j}{42.43\angle 44.99} = \frac{V_x}{50}$$

$$24\angle -90^\circ - 0.1V_x\angle -90^\circ - \frac{V_x}{42.43}\angle -44.99 = \frac{V_x}{50}$$

$$24\angle -90^\circ = 0.1V_x\angle -90 + \frac{V_x}{42.43}\angle -44.99 + \frac{1}{50}V_x$$

$$= V_x\left(0.1\angle -90 + \frac{1}{42.43}\angle -45 + 0.02\right)$$

(9)