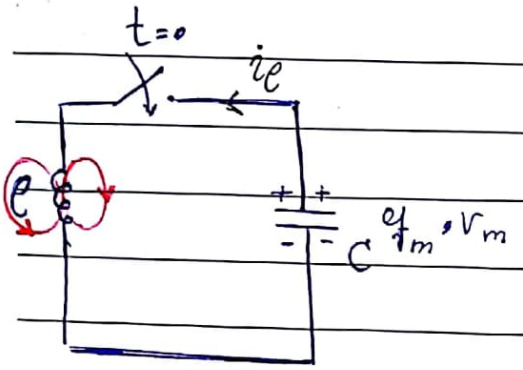
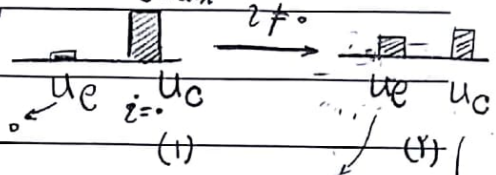
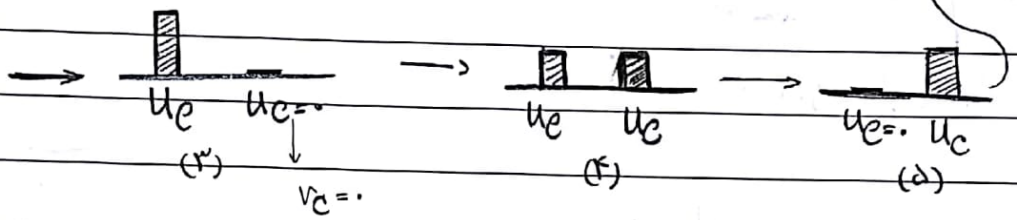
Subject:
Year: Month: Day:

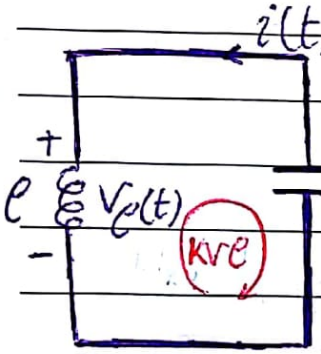
نوسانات الکترومغناطیسی و جریان‌های متناوب:



$$\begin{cases} V_C(t=0) = V_m \\ i_e(t=0) = 0 \end{cases}$$







KVL: $V_e = V_C \longrightarrow e\frac{di_e(t)}{dt} \longrightarrow -C\frac{dV_C(t)}{dt}$

$$-eC\frac{d^2V_C(t)}{dt^2} = V_C(t)$$

$$\longrightarrow \begin{cases} eC\dfrac{d^2V_C(t)}{dt} + V_C(t) = 0 \\ V_C(t=0) = V_m \\ \left.\dfrac{dV_C(t)}{dt}\right|_{t=0} = 0 \end{cases} \longrightarrow eCs^2 + 1 = 0 \longrightarrow$$

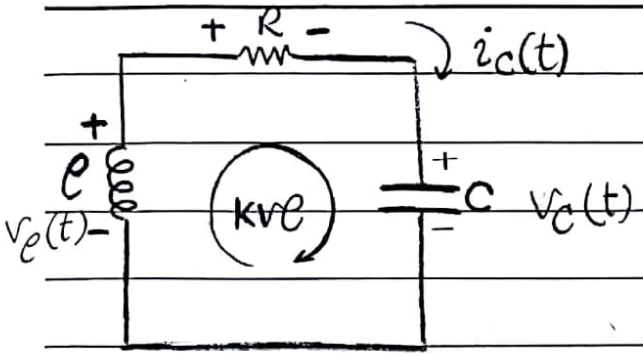
$$s = \pm i\frac{1}{\sqrt{eC}} \longrightarrow$$

$$V_C(t) = A\cos(\omega t) \longrightarrow i(t) = -CV_m\omega\underbrace{(-\sin\omega t)}_{\cos(\omega t - \frac{\pi}{2})}$$

V_m $\quad \frac{1}{\sqrt{eC}}$

AIDIN $\quad \left(\dfrac{di}{dt}\right)_{max} = ?$

Subject:
Year: Month: $V_R(t)$ Day:



$\frac{C\,dv_C}{dt}$

$Ri_C(t)$

RLC:

KVL: $V_e = V_R + V_C \longrightarrow$

$-e\frac{di_C}{dt} \rightarrow \frac{C\,dv_C}{dt}$

$$+LC\frac{d^2v_C(t)}{dt^2} + RC\frac{dv_C(t)}{dt} + V_C = 0 \longrightarrow \frac{d^2v_C(t)}{dt} + \frac{RC}{LC}\frac{dv_C(t)}{dt}$$

2α

$$+\frac{1}{LC}V_C = 0 \longrightarrow S^2 + 2\alpha S + \omega_0^2 = 0$$

ω_0^2

$$\rightarrow S = \alpha \pm \sqrt{\alpha^2 - \omega_0^2}$$

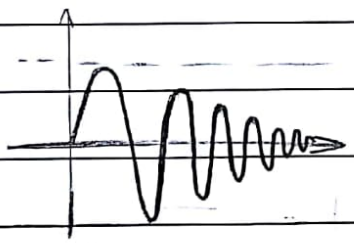
$V_C(t=0) = V_m$

$\left.\frac{dv_C(t)}{dt}\right|_{t=0} = 0$

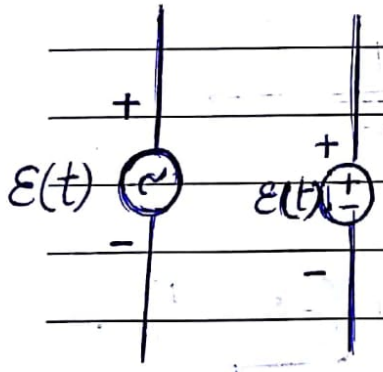
حالات خاص: $if \Rightarrow \omega_0^2 > \alpha^2 \longrightarrow$

$$V_C(t) = Ae^{-\alpha t}\cos(\omega t)$$

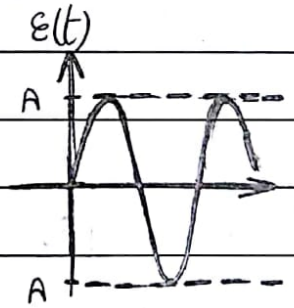
$A \rightarrow V_m$, $\alpha \rightarrow \frac{R}{2e}$, $\omega \rightarrow \sqrt{\omega_0^2 - \alpha^2}$

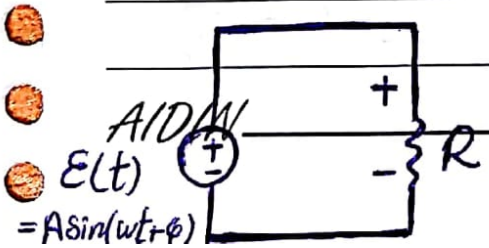


نوسانات واداشته ← نوسانات الکترومغناطیس



$$\mathcal{E}(t) = A\sin(\omega t + \varphi)$$





$V_R = A\sin(\omega t + \varphi)$, $A \rightarrow V_m$

بارمتاوبر:

$$i_R = \frac{V_R}{R} = \frac{A}{R}\sin(\omega t + \varphi) = I_m \sin(\omega t + \varphi)$$

Subject:
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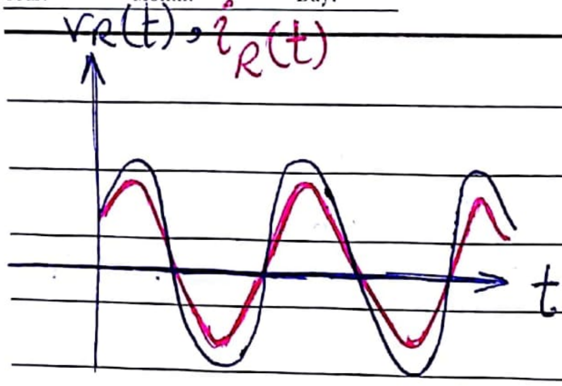


$$\frac{V_m}{I_m} = R$$

نمایش فازوری یک تابع سینوسی:

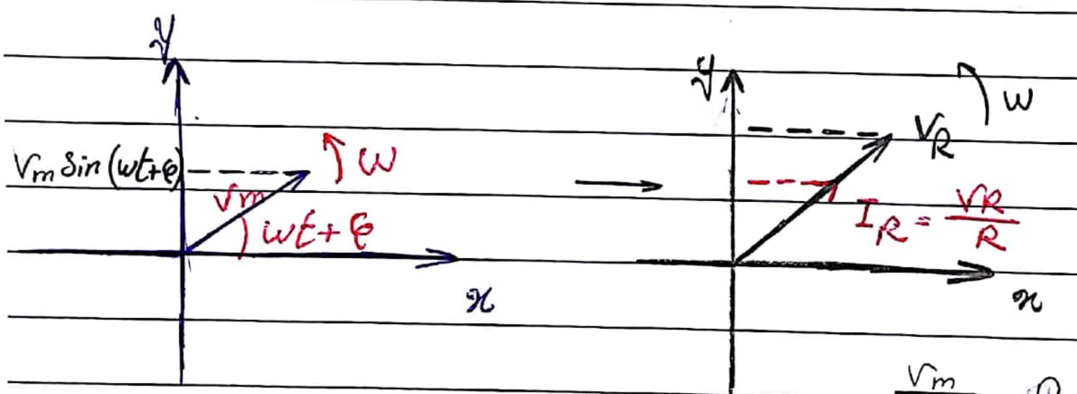
۱) تعریف یک بردار در فضای مختلط

$$v_R(t) = V_m \sin(\omega t + \varphi)$$

۲) اندازه‌ی بردار برابر با دامنه‌ی تابع سینوسی

۳) زاویه‌ای که بردار در هر لحظه از زمان با محور x ها می‌سازد برابر با زاویه‌ی داخل تابع سینوسی در آن لحظه از زمان

است.



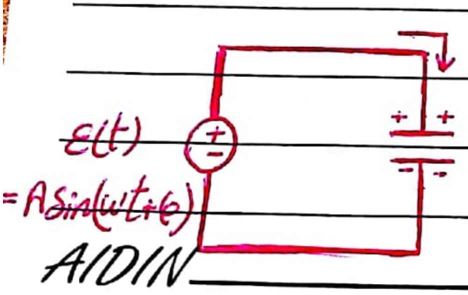
$V_R = V_m \angle \varphi$

$I_R = I_m \angle \varphi$

$$\frac{V_m}{I_m} = R$$

بار خازنی:

$$v_C(t) = V_m \sin(\omega t + \varphi)$$



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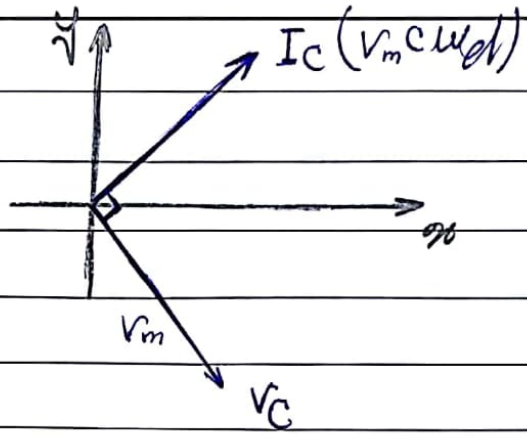
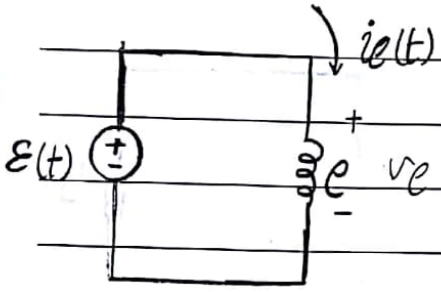
$v_C(t) = V_m \sin(\omega_d t + \varphi) \longrightarrow$

$$i_C(t) = C\frac{dv_C(t)}{dt} = C V_m \omega_d \cos(\omega_d t + \varphi) = C V_m \omega_d \sin\left(\omega_d t + \varphi + \frac{\pi}{2}\right)$$

Subject:
Year: Month: Day:

$\frac{V_m}{I_m} = \frac{1}{C\omega_d}$, $\theta - \varphi = \pi/2$

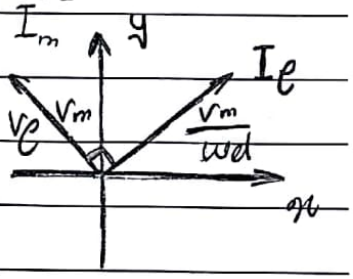




بما أن التيار: $v_\ell(t) = V_m \sin(\omega_d t + \varphi)$

$i_\ell(t) = \frac{1}{\ell}\int v_\ell(t) = \frac{1}{\ell}\frac{V_m}{\omega_d}\left(-\cos(\omega_d t + \varphi)\right)$

$\begin{cases} V_\ell = V_m \angle \varphi \\ I_\ell = I_m \angle \varphi \end{cases}$, $\begin{cases} \frac{V_m}{I_m} = C\omega_d = X_\ell \\ \theta - \varphi = -\pi/2 \end{cases}$



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