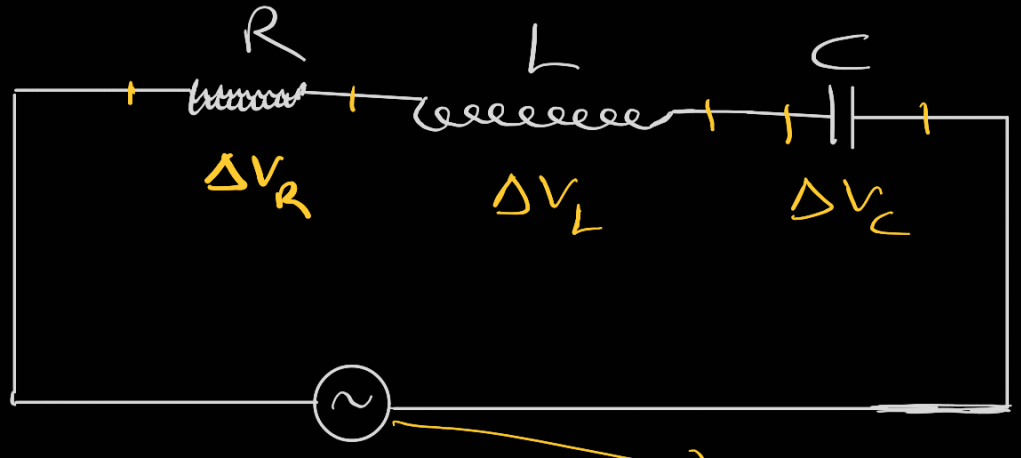
AC devresinde R, L, C



$$\Delta V_R + \Delta V_L + \Delta V_C = \Delta V$$

$$\Delta V = \Delta V_{max} \sin \omega t$$

$$=$$

$$\Delta V_R = (I_{max} R) \sin \omega t$$

$$+$$

$$\Delta V_L = (I_{max} X_L) \sin\left(\omega t + \frac{\pi}{2}\right)$$

$$+$$

$$\Delta V_C = (I_{max} X_C) \sin\left(\omega t - \frac{\pi}{2}\right)$$

I_{max}'lar herhangi bir anda hepsi için eşittir.

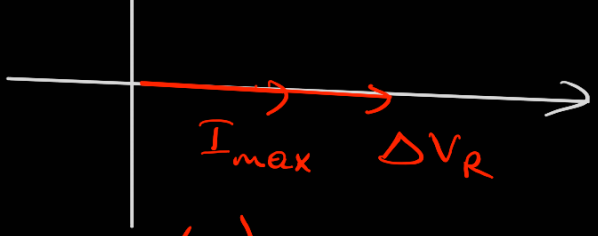
$X_L = \omega L$ → indüktif reaktans

$X_C = \frac{1}{\omega C}$ → sigal reaktans

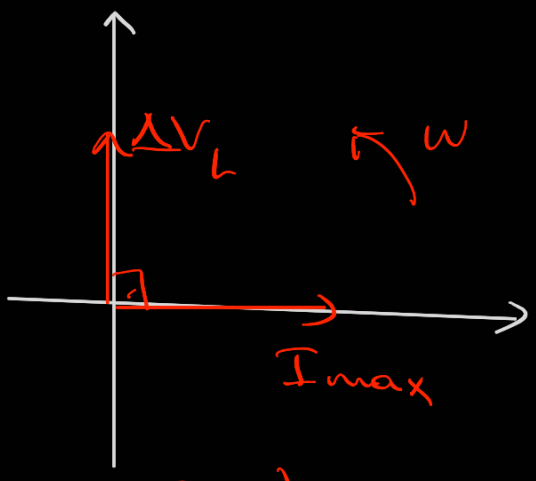
Fazör diagramları

↑

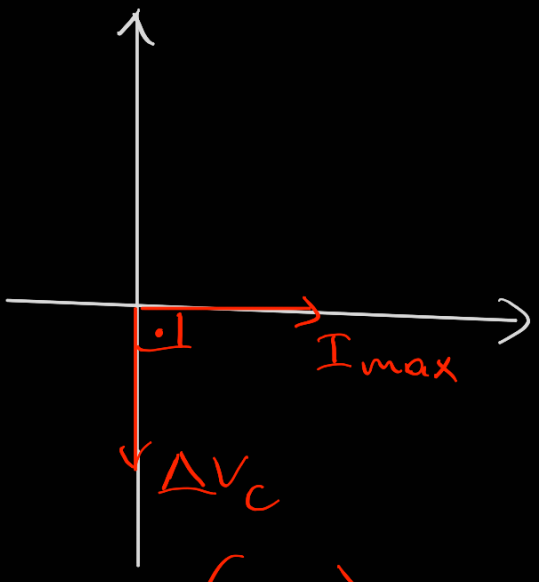
↺ ω


I_{max}
ΔV_R

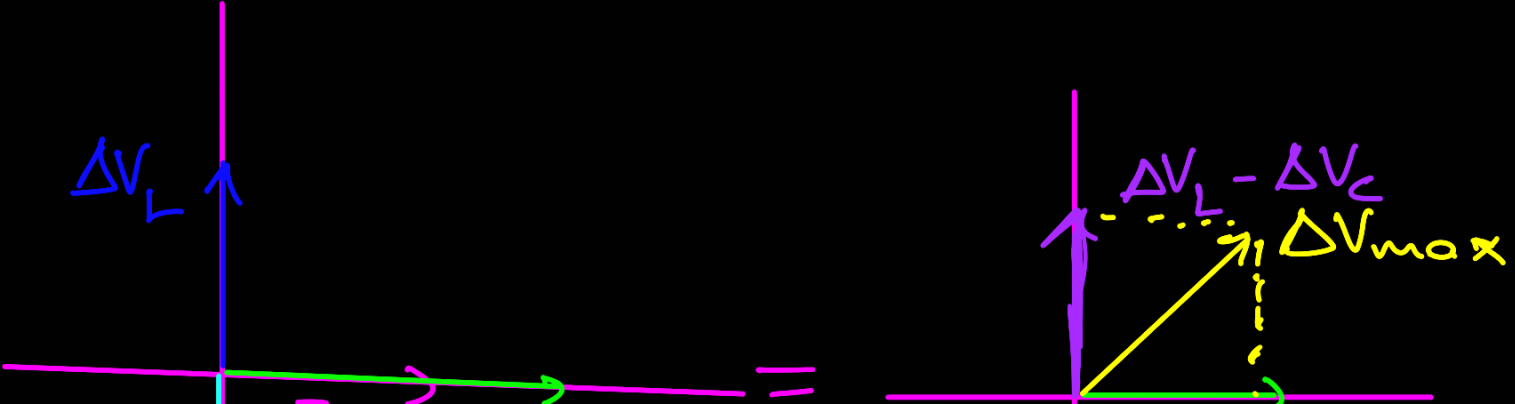
(R)

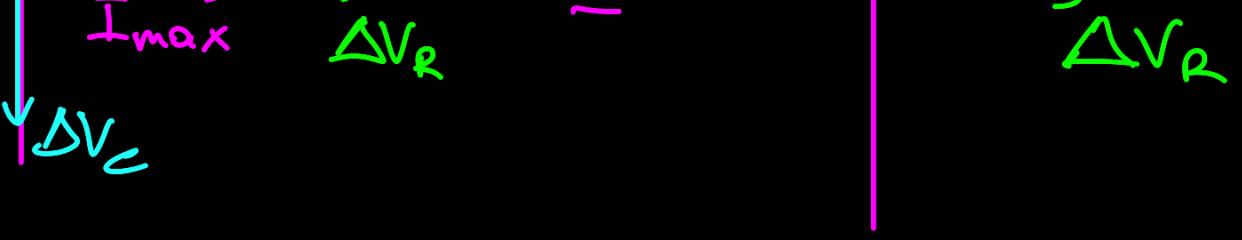

ΔV_L
ω
I_{max}

(L)


I_{max}
ΔV_C

(C)


ΔV_L
$\Delta V_L - \Delta V_C$
ΔV_{max}



$$\Delta V_{max} = \sqrt{\Delta V_R^2 + (\Delta V_L - \Delta V_C)^2}$$

$$\Delta V_{max} = \sqrt{I_{max}^2 R^2 + (I_{max} X_L - I_{max} X_C)^2}$$

$$\Delta V_{max} = I_{max} \sqrt{R^2 + (X_L - X_C)^2}$$

$$I_{max} = \frac{\Delta V_{max}}{\sqrt{R^2 + (X_L - X_C)^2}}$$

#Link

$$I = \frac{\Delta V}{R}$$

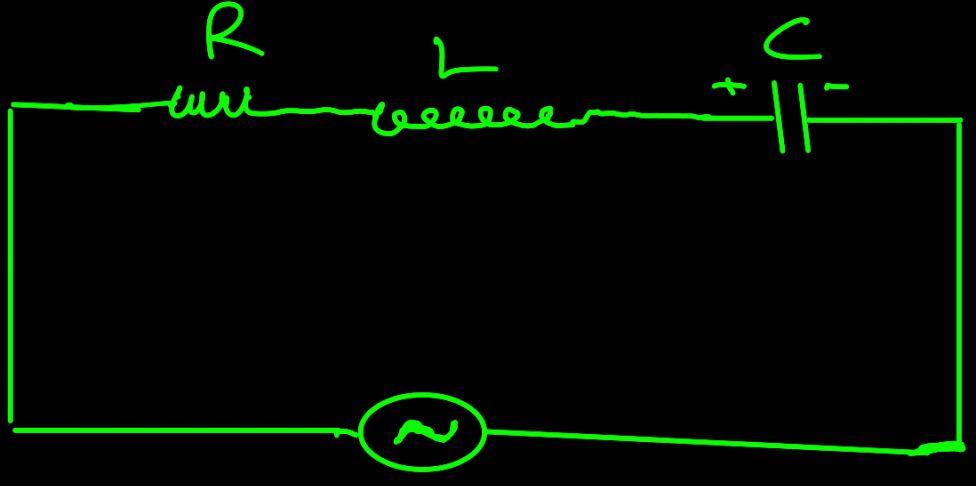
$$Z \equiv \sqrt{R^2 + (X_L - X_C)^2}$$

Devrenin etkin, efektif eşdeğer direncidir.

$$\Delta V = \Delta V_{max} \sin \omega t$$

$$I = \frac{\Delta V_{max}}{Z} \sin\left[\omega t - \tan^{-1}\left(\frac{X_L - X_C}{R}\right)\right]$$

Örnek Soru :



$\Delta V = (\Delta V_{max}) \sin \omega t$

$R = 425\ \Omega$

$L = 1.25\ H$

$C = 3.5\ \mu F$

$f = 60\ Hz$

$\Delta V_{max} = 150\ V$

a) Devrenin indüktif reaktansını (X_L), sığaal R. (X_C) ve empedansını (Z) bulunuz.

b) Devreden akan akımın max değerini bulunuz.

c) Voltajla akım arasındaki faz açısını

bulunuz.

d) Her devre elemanı arasındaki max gerilimi bulunuz.

---

a) $X_L = \omega L = 2\pi f L$

$X_L = (2\pi)(60s^{-1})(1.25H)$

$X_L = 471\,\Omega$

$X_C = \frac{1}{\omega C} = \frac{1}{2\pi f C}$

$X_C = \frac{1}{(2\pi)(60s^{-1})(3.5 \times 10^{-6}F)}$

$X_C = 758\,\Omega$

$Z = \sqrt{R^2 + (X_L - X_C)^2}$

$Z = \sqrt{(\quad)^2 + (\quad)^2}$

$$Z = \sqrt{(425\,\Omega)^2 + (471\,\Omega - 758\,\Omega)^2}$$

$$Z = 513\,\Omega$$

b) $$I_{max} = \frac{\Delta V_{max}}{Z}$$

$$I_{max} = \frac{150\,V}{513\,\Omega} = 0.29\,A$$

c) $$\phi = \tan^{-1}\left(\frac{X_L - X_C}{R}\right)$$

$$\phi = \tan^{-1}\left(\frac{471 - 758}{425}\right)$$

$$\phi = -34^\circ$$

d) $$\Delta V_R = I_{max} R$$

$$\Delta V_L = I_{max} X_L$$

$$\Delta V_C = I_{max} X_C$$

$$\Delta V_R = 123\,V$$

$$\Delta V_L = 137\,V$$

$$\Delta V_C = 220\,V$$