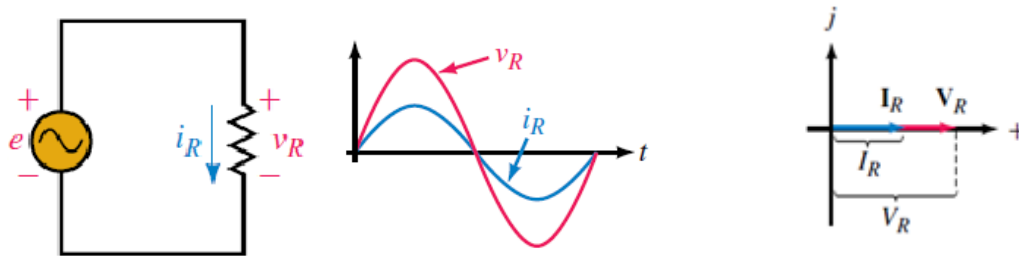
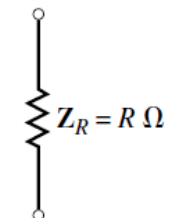
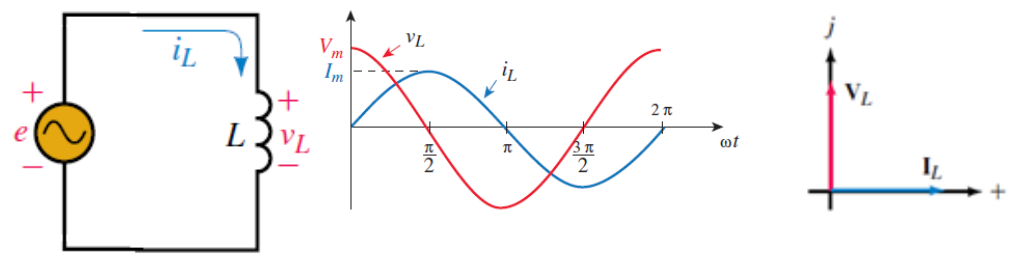
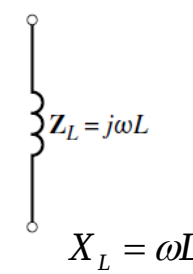
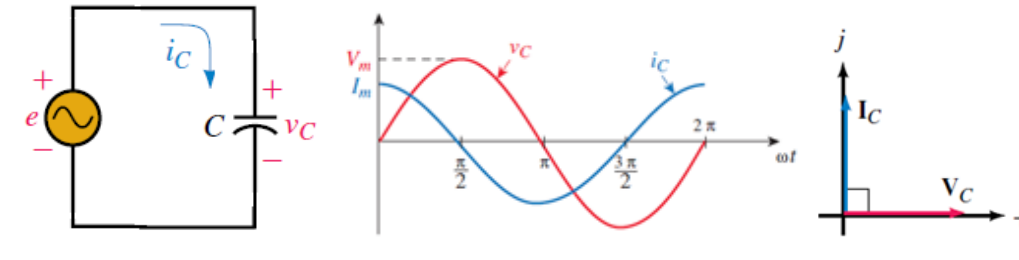
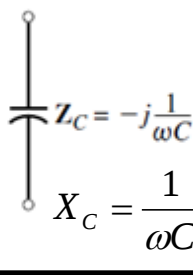
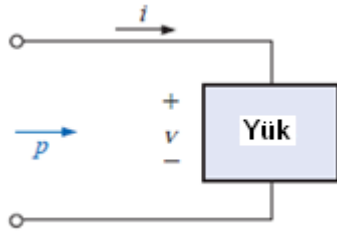


Temel Devre Elemanları-AC Sinüsoidal Sistem

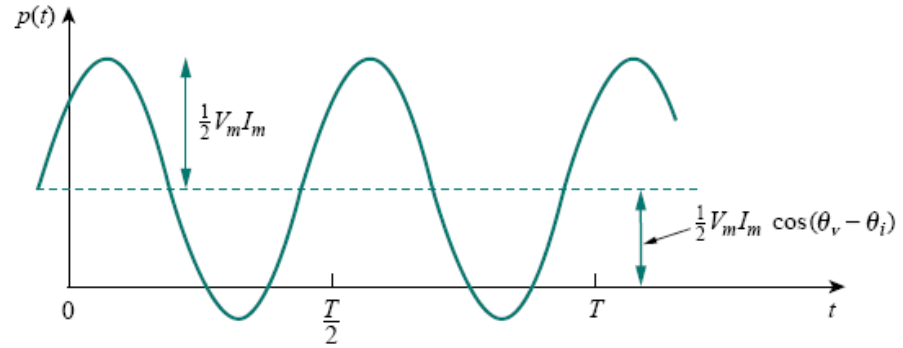
Direnç		$Z_R = \frac{V_R}{I} = \frac{V_R \angle 0^\circ}{I \angle 0^\circ}$	
Endüktans		$Z_L = \frac{V_L}{I} = \frac{V_L \angle 0^\circ}{I \angle -90^\circ}$	$\omega = 2\pi f$ 
Kapasite		$Z_C = \frac{V_C}{I} = \frac{V_C \angle 0^\circ}{I \angle 90^\circ}$	

Alternatif Akımda Güç



$$v(t) = V_m \cos(\omega t + \theta_v)$$

$$i(t) = I_m \cos(\omega t + \theta_i)$$



$$p(t) = v(t)i(t) = V_m I_m \cos(\omega t + \theta_v) \cos(\omega t + \theta_i) \quad \cos A \cos B = \frac{1}{2} [\cos(A - B) + \cos(A + B)]$$

$$p(t) = \frac{1}{2} V_m I_m \cos(\theta_v - \theta_i) + \frac{1}{2} V_m I_m \cos(2\omega t + \theta_v + \theta_i)$$

$$P = \frac{1}{T} \int_0^T p(t) dt \quad P = \frac{1}{T} \int_0^T \frac{1}{2} V_m I_m \cos(\theta_v - \theta_i) dt + \frac{1}{T} \int_0^T \frac{1}{2} V_m I_m \cos(2\omega t + \theta_v + \theta_i) dt$$

$$P = \frac{1}{2} V_m I_m \cos(\theta_v - \theta_i)$$

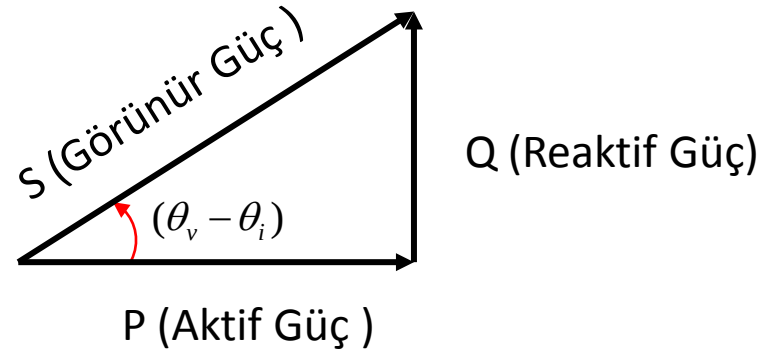
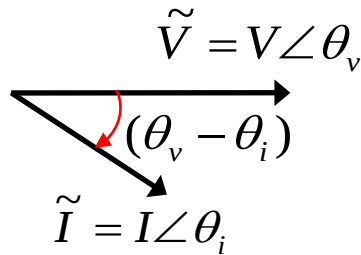
Güç Üçgeni

Aktif ve Reaktif güç kullanılarak bir Güç Üçgeni çizilebilir.

$$P = \frac{V_{\max}}{\sqrt{2}} \frac{I_{\max}}{\sqrt{2}} \cos(\theta_v - \theta_i) = V_{\text{eff}} I_{\text{eff}} \cos(\theta_v - \theta_i),$$

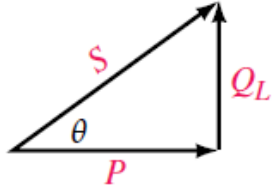
$$Q = \frac{V_{\max}}{\sqrt{2}} \frac{I_{\max}}{\sqrt{2}} \sin(\theta_v - \theta_i) = V_{\text{eff}} I_{\text{eff}} \sin(\theta_v - \theta_i),$$

$$S = \tilde{V} \tilde{I}^* = P + jQ$$



Güç Faktörü $\cos(\varphi) = \cos(\theta_v - \theta_i)$

Görünür Güç ve Güç Üçgeni



$$P = VI \cos \theta = S \cos \theta \quad (\text{W})$$

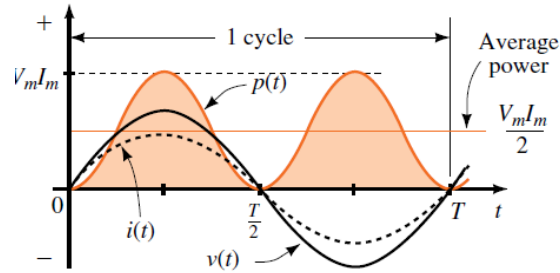
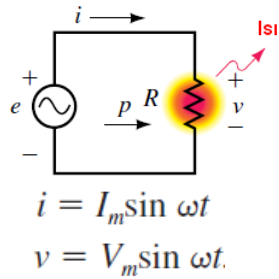
$$Q = VI \sin \theta = S \sin \theta \quad (\text{VAR})$$

Aktif Güç	Reaktif Güç	Görünür Güç
P	Q	S
Watt	VAR	VA

$$S = VI^*$$

Temel Devre Elemanları-AC Sinüsoidal Sistemde Güç

Direnç



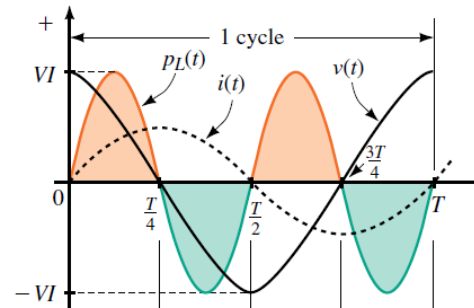
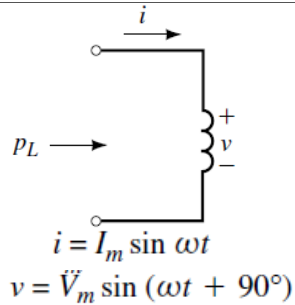
Aktif Güç

$$P = VI \quad (\text{watts})$$

$$P = I^2 R$$

$$= V^2 / R$$

Endüktans

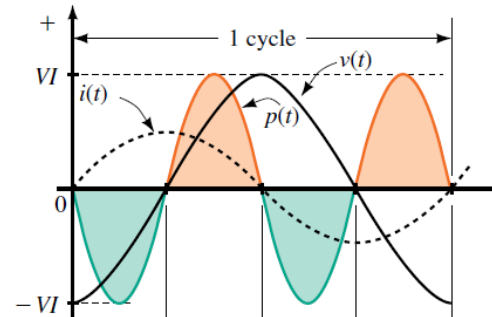
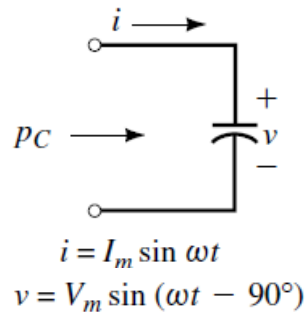


Reaktif Güç

$$Q_L = VI \quad (\text{VAR})$$

$$Q_L = I^2 X_L = \frac{V^2}{X_L}$$

Kapasite



Reaktif Güç

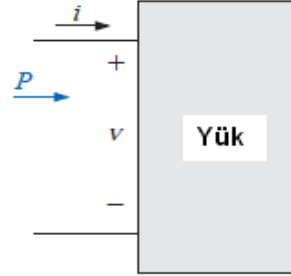
$$Q_C = VI \quad (\text{VAR})$$

$$Q_C = I^2 X_C = \frac{V^2}{X_C}$$

Örnek: Giriş akım ve gerilim değerleri aşağıdaki gibi verilen bir devre için aktif güç, reaktif güç ve görünür güç değerlerini hesaplayınız.

$$i(t) = 3\sin(\omega t + 50^\circ)$$

$$v(t) = 150\sin(\omega t + 70^\circ)$$



Çözüm: Gerilim ve akım arasında bir faz farkı vardır. Bu durumda devrede hem aktif hem de reaktif güç olacaktır. Devreye verilen toplam güç ise görünür güç olarak hesaplanır.

$$P = V_{eff} I_{eff} \cos(\varphi)$$

$$Q = V_{eff} I_{eff} \sin(\varphi)$$

$$S = V_{eff} I_{eff}$$

$$\cos(\varphi) = \cos(\theta_v - \theta_i) = \cos(70^\circ - 50^\circ)$$

$$V_{eff} = \frac{V_{max}}{\sqrt{2}}$$

$$I_{eff} = \frac{I_{max}}{\sqrt{2}}$$

$$P = \frac{150}{\sqrt{2}} \frac{3}{\sqrt{2}} \cos(20) = 211.43W$$

$$Q = \frac{150}{\sqrt{2}} \frac{3}{\sqrt{2}} \sin(20) = 76.95VA \text{ (endüktif)}$$

$$S = \frac{150}{\sqrt{2}} \frac{3}{\sqrt{2}} = 225VA$$

$$S = \sqrt{211.43^2 + 76.95^2}$$

$$S = 225VA$$

Kaynaklar:

- 1) UGETAM Ders Notları, Y.Doç.Dr. Uğur Savaş SELAMOĞULLARI