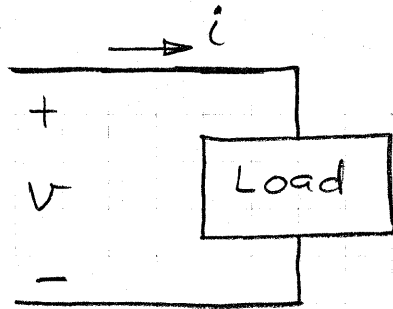


### Problem 3-1



$$\bar{V} = V \angle 0^\circ$$

$$\bar{I} = I \angle -\phi^\circ$$

$$v = \sqrt{2} V \cos \omega t, \quad i = \sqrt{2} I \cos(\omega t - \phi)$$

$$p(t) = v(t) \cdot i(t) = 2 V I \cos \omega t \cdot \cos(\omega t - \phi)$$

$$= V I [\cos \phi + \cos(2\omega t - \phi)]$$

$$= V I \cos \phi + V I \cos(2\omega t - \phi)$$

$$= V I \cos \phi + V I \cos \phi \cdot \cos 2\omega t + V I \sin \phi \cdot \sin 2\omega t$$

$$= P + P \cos 2\omega t + Q \sin 2\omega t$$

where,  $P = V I \cos \phi$  and,

$$Q = V I \sin \phi$$