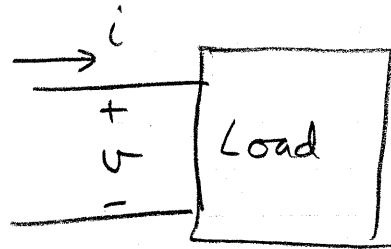


Problem 5-3



$$v = V_d + \sqrt{2} V_1 \cos \omega_1 t + \sqrt{2} V_1 \sin(\omega_1 t) + \sqrt{2} V_3 \cos \omega_3 t$$

$$i = I_d + \sqrt{2} I_1 \cos \omega_1 t + \sqrt{2} I_3 \cos(\omega_3 t - \phi_3)$$

$$(a) \quad P = V_d I_d + V_1 I_1 + V_3 I_3 \cos \phi_3$$

$$(b) \quad V = \sqrt{V_d^2 + (\sqrt{2} V_1)^2 + V_3^2}$$

$$I = \sqrt{I_d^2 + I_1^2 + I_3^2}$$

$$(c) \quad \text{PF} = \frac{P}{V I} \quad ; \quad \text{substitute the expressions from parts (a) and (b).}$$