

6.93 Det samlede effektforbrug i en parallelforbindelse er 3000 W, idet spændingen over parallelforbindelsen er 500 V og frekvensen er 50Hz. Den samlede strøm er 7,8 A. Den ene gren i forbindelsen er en resistans på 250 Ohm, den anden er en selvinduktionsspole. Bestem

- resistansens effektforbrug
- spolens effektforbrug
- strømmen i spolen
- spolens induktans
- den i spolen inducerede elektromotoriske kraft.

$$P := 3000 \cdot \text{W}$$

$$U := 500 \cdot \text{V}$$

$$R_1 := 250 \cdot \Omega$$

$$I := 7.8 \text{ A}$$

$$f := 50 \text{ Hz}$$

a) resistansens effektforbrug

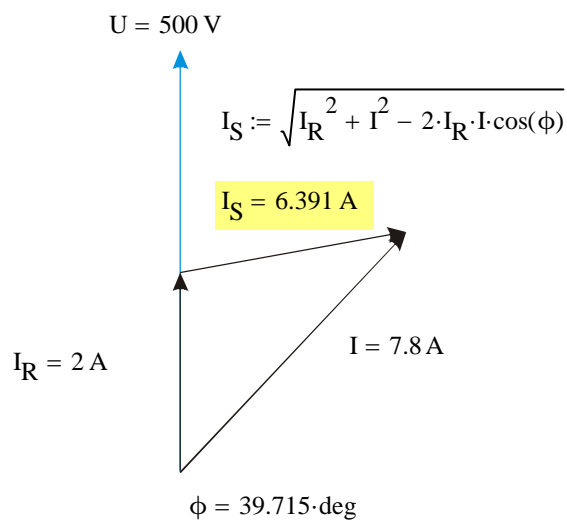
$$P_R := \frac{U^2}{R_1} = 1000 \text{ W}$$

b) spolens effektforbrug

$$P_S := P - P_R = 2000 \text{ W}$$

c) strømmen i spolen

$$I_R := \frac{U}{R_1} = 2 \text{ A}$$



$$\cos \phi = \frac{P}{S} = \frac{P}{U \cdot I}$$

↓

$$\phi := \arccos\left(\frac{P}{U \cdot I}\right) = 39.715 \text{ deg}$$

d) spolens induktans

$$Z_S := \frac{U}{I_S} = 78.24 \Omega$$

$$\cos\phi_S := \frac{P_S}{U \cdot I_S} = 0.626$$

$$\phi_S := \arccos(\cos\phi_S) = 51.25 \text{ deg}$$

$$X_L := Z_S \cdot \sin(\phi_S) = 61.018 \Omega$$

$$L_S := \frac{X_L}{2 \cdot \pi \cdot f} = 0.194 \text{ H}$$

e) den i spolen inducerede elektromotoriske kraft

$$E_S := I_S \cdot X_L = 389.945 \text{ V}$$

komplekst beregnet:

$$\angle(\text{mag}, \text{ang}) := \text{mag} \cdot (\cos(\text{ang}) + i \cdot \sin(\text{ang}))$$

$$R_1 = 250 \Omega$$

$$P_1 := \frac{U^2}{R_1} = 1000 \text{ W}$$

$$P_2 := P - P_1 = 2000 \text{ W}$$

$$\varphi_{\text{kreds}} := -\arccos\left(\frac{P}{U \cdot I}\right) = -39.715 \text{ deg}$$

$$I_{\text{res}} := (7.8 \text{ A}) \angle \varphi_{\text{kreds}} = (6 - 4.984i) \text{ A}$$

$$I_1 := \frac{U}{R_1} = 2 \text{ A}$$

$$I_2 := I_{\text{res}} - I_1 = (4 - 4.984i) \text{ A}$$

$$Z_{\text{spole}} := \frac{U}{I_2} = (48.972 + 61.018i) \Omega$$

$$X_L := \text{Im}(Z_{\text{spole}}) = 61.018 \Omega$$

$$E_S := |I_2 \cdot X_L| = 389.945 \text{ V}$$

eller

$$\text{VAr} := W \quad \text{VA} := W$$

$$P_1 = 1000 \text{ W}$$

$$S_2 := U \cdot \overline{I_{\text{res}}} - P_1 = (2000 + 2491.987i) \text{ VA}$$

$$Z_2 := \left(\frac{U^2}{S_2} \right) = (48.972 + 61.018i) \Omega$$

$$X_{L..} := \text{Im}(Z_2) = 61.018 \Omega$$