

## Problem 17.45

$$P_{out} = 10hp = 7460 \text{ W}$$

$$P_{in} = P_{out} + P_r + P_{copper} = 7740 \text{ W}$$

$$V_s = \frac{230}{\sqrt{3}} = 132.8 \text{ V}$$

$$I_s = \frac{7740}{3 \times 132.8 \times 0.8} = 24.3 \angle 36.87^\circ \text{ A}$$

$$E_b = V_s - I_s (6 \angle 90^\circ) = 249.2 \angle -27.9^\circ \text{ V}$$

$$\eta = \frac{7460}{7740} = 0.964 = 96.4\%$$

$$\delta = -27.9^\circ$$

## Problem 17.48

$$V_s = \frac{600}{\sqrt{3}} = 346.4 \angle 0^\circ \text{ V}$$

$$Z_s = 5 + j50 = 50.25 \angle 84.29^\circ \Omega$$

$$PF = 0.707; \theta = 45^\circ$$

$$P_{in} = 3|V_s||I_s| \cos \theta$$

$$I_s = \frac{24000}{3 \times 346.4 \times 0.707} = 32.67 \angle 45^\circ \text{ A}$$

$$E_b = V_s - I_s Z_s = 1385 - j1270.6 = 1880.3 \angle -42.51^\circ \text{ V}$$

$$\delta = -42.51^\circ$$

$$P_{dev} = 3|E_b||I_s| \cos(45 + 42.51) = 8 \text{ kW}$$

$$P_{loss} = 3|I_s|^2 R_s = 16 \text{ kW}$$

