

$$P = 1.4 \text{ MW} = 1.4 \text{ pu}$$

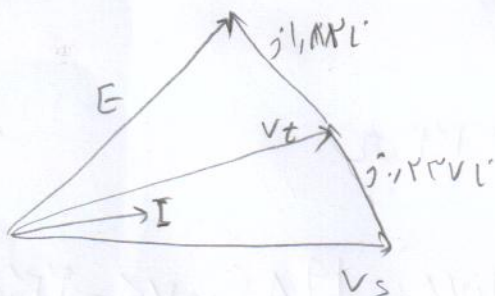
$$P = \frac{V_t V_s}{X_s} \sin(\alpha) \Rightarrow 1.4 = \frac{100 \times 100}{2.21} \sin(\alpha) \Rightarrow \alpha = 1.14^\circ$$

$$I = \frac{V_t - V_s}{j2.21} = \frac{2.21 \angle 1.14^\circ - 2.21 \angle 0^\circ}{(2.21) \sqrt{2}} = \frac{1.54 \angle 1.14^\circ}{\sqrt{2}} \angle 13.92^\circ$$

$$X_t = 1.12 \times Z_b = 1.12 \times \frac{2.21}{400} = 1.412 \Omega$$

$$E = V_t + jX_t I = \left(\frac{2.21 \angle 1.14^\circ}{\sqrt{2}} \right) + j1.412 \times \frac{1.54 \angle 1.14^\circ}{\sqrt{2}} \angle 13.92^\circ$$

$$\Rightarrow E = 2.599 \angle 10.4^\circ \text{ pu}$$



$$1) |I| = 953.134 \text{ (A)}$$

$$\text{زاویه میان متجه ها} = 10.4^\circ - 13.92^\circ = -3.52^\circ$$

دانی

$$2) PF = \cos(10.4^\circ - 13.92^\circ) = 0.99$$

$$3) |E| = 2.599 \angle 10.4^\circ \text{ pu} \quad |E|_{pu} = 1.4 \text{ pu}$$

$$\delta = 1.14^\circ$$

$$I = \frac{2.21 \angle 1.14^\circ}{\sqrt{2}} \angle 13.92^\circ$$

$$|I| = 1.421 \angle 13.92^\circ$$

$$\text{زاویه میان متجه ها} = 13.92^\circ - 10.4^\circ = 3.52^\circ$$

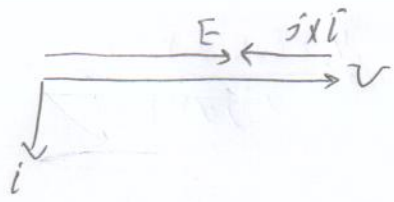
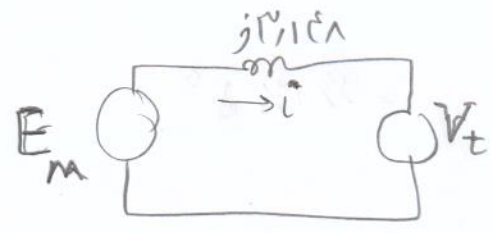
دانی

(2)

الف) $X_s = \frac{1}{1.48} = 0.675 \text{ pu}$ و $X_s = 0.675 \times \frac{11.5^2}{20} = 5.148 \Omega$

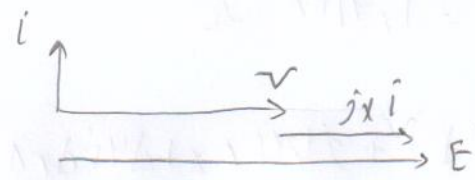
ب) $E = \frac{10}{1.2} \times 11.5 \text{ kV} = 105 \text{ kV}$

چون $E < V$ است بنابراین در حالت سلفی است



ج) $E = \frac{1000}{1.2} \times 11.5 = 9583.33 \text{ V}$

چون $E > V$ است بنابراین خازنی است.



(3)

$P = \sqrt{3} V I \cos \phi \Rightarrow 1000 \times \sqrt{3} \times 4 = \sqrt{3} \times 2200 \times I \times 0.8$

$\Rightarrow I = 220.7 \text{ A}$

$X_s = 0.1 \text{ pu} \Rightarrow X_s = 0.1 \times \frac{2200^2}{10} = 484 \Omega$

$\Rightarrow E_{A_{1\phi}} = \frac{2200}{\sqrt{3}} - j 484 \times 220.7 \angle 31.7^\circ = 1272.4 \angle -23.5^\circ$

ب) $P_{max} = \frac{V E}{X} = \frac{\sqrt{3} \times 1272.4 \times 2200}{484} = 1144 \text{ W}$

$T_{max} = \frac{1144 \times 10^4}{\frac{120}{10} \times 40 \times \frac{2\pi}{60}} = 28.8 \text{ N.m}$

ج) $1000 \times \sqrt{3} \times 4 = \frac{2200 \times E}{484} \Rightarrow E_{min} = 1272.4 \text{ V}$

$\Rightarrow \frac{|E_{min} - E|}{E} = \frac{|1272.4 - 1918.5|}{1918.5} = 33.7\%$

$$k_s = \frac{120}{P} f \Rightarrow P = \frac{120 \times 40}{1800} = 4$$

٢٠٠٠٠ اسب بفارمیچ است

$$Z_b = \frac{V_b}{I_b} = \frac{4400}{\sqrt{3} \times 1350} = 2,1122 \Omega$$

$$R_a = 0,012 \times 2,1122 = 0,025 \Omega \quad \text{و} \quad X_s = 0,95 \times 2,1122 = 2,0066 \Omega$$

ج)

$$11) T = \frac{20 \times 744000}{1800 \times \frac{2\pi}{40}} = 79153,058 \text{ N.m}$$

$$\eta = \frac{20000 \times 744}{\sqrt{3} \times 4400 \times 1350} = 99,47\%$$

$$\text{تلفات تقریبی: } P = 0,025 \times 120 = 440$$

$$\text{کلی تلفات: } P_{in} - P_{out} = 0,12572 \text{ kW}$$

$$\text{تلفات فرضی: } 0,12572 - 440 - 0,025 \times 1350^2 = 241,77 \text{ kW}$$

$$E_A = \frac{4400}{\sqrt{3}} - 0,025 \times 1350 = 3744,99 \text{ V}$$

$$I_f \approx 4,2 \text{ A}$$

الف) باتوجه به نمودار

$$ب) E = \frac{2300}{\sqrt{3}} + (0,15 + j0,11) \times \frac{10^4}{\sqrt{3} \times 2300} = 2441,38 \angle 7,41^\circ$$

$$\Rightarrow E_{230} = 2441,38 \angle 7,41^\circ$$

$$ج) E = 2441,38 \rightarrow I_f \approx 4 \text{ (A)}$$

$$د) R_{\text{تقریب}} = \frac{200}{4} = 50,5 \Rightarrow P_{\text{loss}} = 50,5 \times 34 = 1717$$

$$P_{\text{loss}_{cu, T}} = \frac{1}{2} I_D \times \left(\frac{10^4}{\sqrt{2} \times 2200} \right)^2 = 9541,11 \text{ W}$$

$$\Rightarrow P_{in} = 9541,11 + 1200 + 22 \times 10^3 \times 11 \times 10^3 + 10^4 \times 41 = 1402,441 \text{ kW}$$

$$P_{in} = T \omega \Rightarrow T_{in} = \frac{1402,441 \text{ kW}}{\frac{120}{60} \times 40 \times \frac{2\pi}{60}} = 2241,67 \text{ N.m}$$