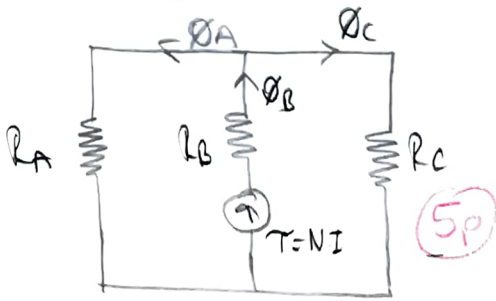


Elektrik Makinaları Dersi

Vize Soruları Bahar 2021-2022

Soru 1.)



(5p)

$$R_C = \frac{3 \cdot 10^{-3}}{4\pi \cdot 10^{-7} \cdot 5,4 \cdot 12 \cdot 10^{-4}} = 3,686 \cdot 10^5 \text{ } 1/H$$

(5p)

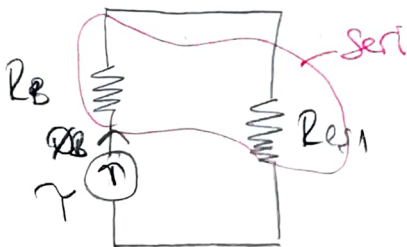
$$R_B = \frac{2 \cdot 10^{-3}}{4\pi \cdot 10^{-7} \cdot 5,4 \cdot 12 \cdot 10^{-4}} = 2,457 \cdot 10^5 \text{ } 1/H$$

(5p)

$$R_A = \frac{1 \cdot 10^{-3}}{4\pi \cdot 10^{-7} \cdot 12 \cdot 10^{-4}} = 6,634 \cdot 10^5 \text{ } 1/H$$

$$R_{es1} = R_A \parallel R_C = \frac{R_A \cdot R_C}{R_A + R_C} = \frac{(6,634 \cdot 10^5) \cdot (3,686 \cdot 10^5)}{6,634 \cdot 10^5 + 3,686 \cdot 10^5}$$

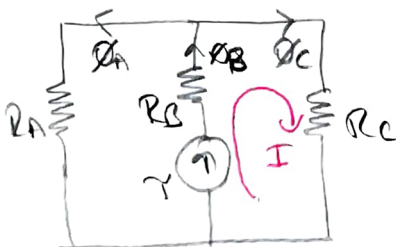
$$R_{es1} = 2,37 \cdot 10^5 \text{ } 1/H$$



$$R_T = R_{es1} + R_B$$

$$R_T = 4,827 \cdot 10^5 \text{ } 1/H$$

$$\Phi_B = \frac{400 \cdot 1,5}{4,827 \cdot 10^5} = 1,24 \cdot 10^{-3} \text{ } \text{wb} \quad (10p) \quad \Phi_A = \Phi_B \cdot \frac{R_C}{R_A + R_C}$$



$$\Phi_B = \Phi_A + \Phi_C$$

I nokta loop:

$$-600 + [2,457 \cdot 10^5 \cdot 1,24 \cdot 10^{-3}] + \Phi_C \cdot 3,686 \cdot 10^5 = 0$$

$$\Phi_C \cdot 3,686 \cdot 10^5 = 295,332$$

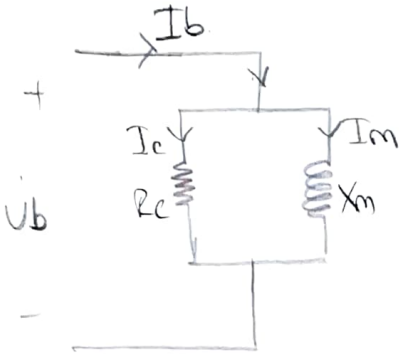
$$\Phi_C = 0,801 \cdot 10^{-3} \text{ } \text{wb}$$

$$\Phi_A = \Phi_B - \Phi_C \Rightarrow \Phi_A = 0,44 \cdot 10^{-3} \text{ } \text{wb} \quad (10p)$$

Soru 2)

Araık devre deneyi sekonder tarafta yapılmıştır.

$$P_b = V_b \cdot I_b \cdot \cos \theta \Rightarrow \theta = \cos^{-1} \frac{165}{240 \cdot 3,2} \quad \theta = 77,6^\circ$$



$$I_c = I_b \cdot \cos \theta \quad I_c = 3,2 \cdot \cos(77,6) \\ I_c = 0,687 \text{ A}$$

$$I_m = I_b \cdot \sin \theta \Rightarrow I_m = 3,2 \cdot \sin(77,6) \\ I_m = 3,12 \text{ A}$$

$$R_c = \frac{V_b}{I_c} = \frac{240}{0,687} = 349,34 \Omega$$

$$X_m = \frac{V_b}{I_m} = \frac{240}{3,12} = 76,92 \Omega$$

Sonuçlar yüksek peritlim, yani primer tarafta isteniyor.

$$a = \frac{2400}{240} = 10 \quad R_c' = a^2 \cdot R_c = 34934 \Omega \\ X_m' = a^2 \cdot X_m = 7692 \Omega$$

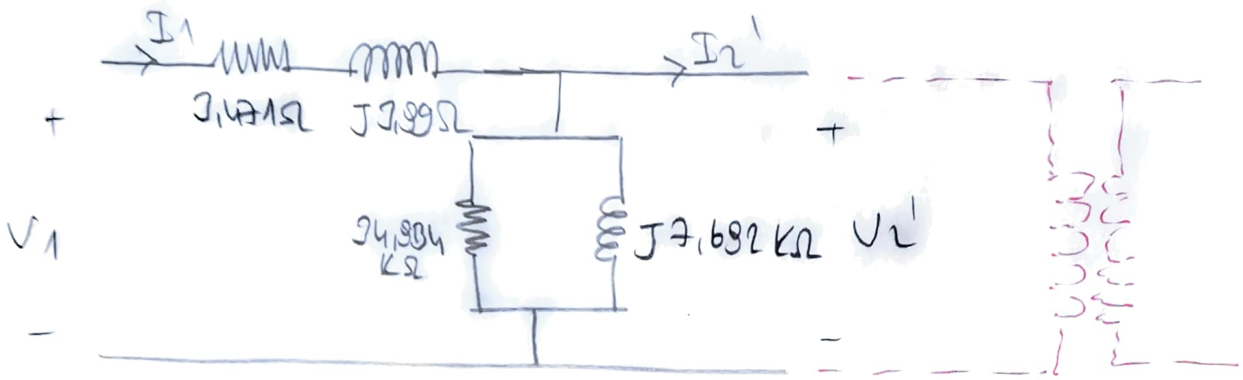
Kısa devre deneyi primer tarafta yapılmıştır.

$$P_k = V_k \cdot I_k \cdot \cos \theta \Rightarrow \theta = \cos^{-1} \left(\frac{375}{55 \cdot 10,4} \right) \Rightarrow \theta = 48,04^\circ$$

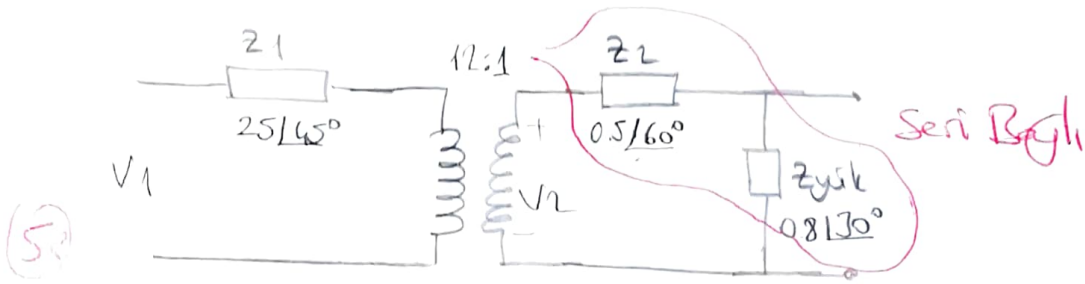
$$Z_{ep} = \frac{V_k}{I_k} \cdot \angle 48,04^\circ = \frac{55}{10,4} \angle 48,04^\circ = 3,171 + j3,99 \Omega$$

$$R_{ep} = 3,171 \Omega, \quad X_{ep} = j3,99 \Omega$$

2. sorunun devamı ...



Soru 3.)



$$Z_{\text{seri}} = Z_2 + Z_{\text{yük}} = 0.5 / 60^\circ + 0.8 / 30^\circ$$

$$Z_{\text{seri}} = 0.5 \cdot (\cos 60 + j \sin 60) + 0.8 \cdot (\cos 30 + j \sin 30)$$

$$Z_{\text{seri}} = 0.25 + j0.433 + 0.692 + j0.4$$

(5P)

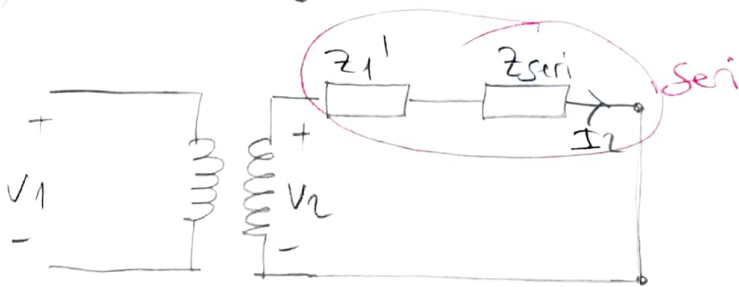
$$Z_{\text{seri}} = 0.942 + j0.833 \Omega$$

Z_1 empedansını sekondere indirgeyalım

$$Z_1' = \frac{1}{a^2} \cdot Z_1 \quad Z_1' = \frac{1}{144} \cdot 25 / 45^\circ \Rightarrow Z_1' = 0.174 / 45^\circ$$

(5P)

$$Z_1' = 0.123 + j0.123 \Omega$$



$$Z_{\text{Toplam}} = Z_1' + Z_{\text{seri}}$$

$$Z_{\text{Toplam}} = 0.123 + j0.123 + 0.942 + j0.833 = 1.063 + j0.953 \Omega = 1.42 / 41.87^\circ$$

$$\frac{V_1}{V_2} = 12 \Rightarrow V_2 = \frac{V_1}{12} = \frac{700}{12} = 58.33 \text{ V}$$

(10P)

$$I_2 = \frac{V_2}{Z_{\text{Toplam}}} = \frac{58.33}{1.063 + j0.953}$$

3. sumber energi ...

$$I_2 = \frac{58,33}{1,42 \angle 41,8^\circ} = 41,05 \angle -41,8^\circ \text{ A} = 30,6 - j27,36 \text{ A}$$

$$S_{\text{pak}} = I_2^2 \cdot Z_y = [41,05 \angle -41,8^\circ]^2 \cdot 0,8 \angle 30^\circ$$

$$S_{\text{pak}} = [1685,102 \angle -83,6^\circ] \cdot 0,8 \angle 30^\circ$$

(100) $S_{\text{pak}} = 1348,08 \angle -53,6^\circ$