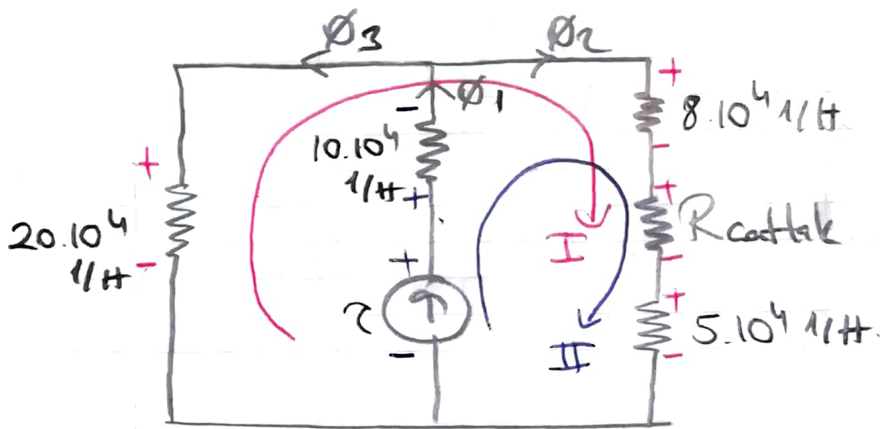


ELEKTRİK MAKİNALARI DERGİ VİZE SINAV YANITLARI

BAHAR - 2023

1.) Esdeğer devre



$$R_{cattak} = \frac{0,1 \cdot 10^{-3}}{4\pi \cdot 10^{-7} \cdot 100 \cdot 10^4}$$

$$R_{cattak} = 7961,8 \text{ H}$$

$$\Phi_3 = 0,5 \cdot 10^{-3} \text{ wb}$$

I nolcu çevrim:

$$-20 \cdot 10^4 \cdot 0,5 \cdot 10^{-3} + \Phi_2 \cdot (8 \cdot 10^4 + 7961,8 + 5 \cdot 10^4) = 0$$

$$13,78 \cdot 10^4 \cdot \Phi_2 = 100$$

$$\Phi_2 = 0,72 \cdot 10^{-3} \text{ wb}$$

Kirchoff akım kanunu:

$$\Phi_1 = \Phi_2 + \Phi_3 \Rightarrow \Phi_1 = 0,72 \cdot 10^{-3} + 0,5 \cdot 10^{-3}$$

$$\Phi_1 = 1,2 \text{ mwb}$$

II nolcu çevrim

$$-\gamma + [10 \cdot 10^4 \cdot 1,2 \cdot 10^{-3}] + [13,78 \cdot 10^4 \cdot 0,72 \cdot 10^{-3}] = 0$$

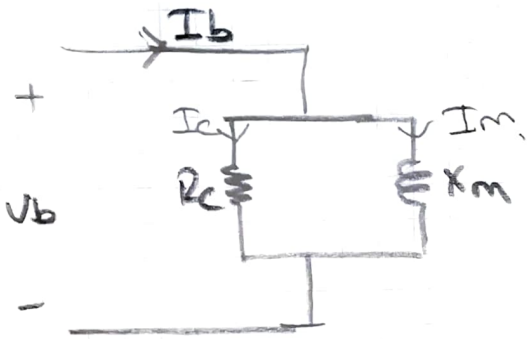
$$\gamma = 120 + 99,288 = 219,288 \text{ V}$$

2.) Arak devre dengyi

$$P_b = U_b \cdot I_b \cdot \cos \theta$$

$$30 = 220 \cdot 0,5 \cdot \cos \theta$$

$$\theta = \cos^{-1} \frac{30}{220 \cdot 0,5} = 74,17^\circ$$



$$I_c = I_b \cdot \cos \theta$$

$$I_c = 0,5 \cdot \cos 74,17^\circ = 0,136 \text{ A}$$

$$I_m = I_b \cdot \sin \theta$$

$$I_m = 0,5 \cdot \sin 74,17^\circ = 0,48 \text{ A}$$

$$R_c = \frac{U_b}{I_c} = \frac{220}{0,136} = 1,61 \cdot 10^3 \Omega$$

$$X_m = \frac{U_b}{I_m} = \frac{220}{0,48} = 458,3 \Omega$$

Ku9 devre dengyi :

$$P_k = U_k \cdot I_k \cdot \cos \theta$$

$$\theta = \cos^{-1} \frac{20,1}{13,2 \cdot 6} \quad \theta = 75,3^\circ$$

$$Z_{e\varphi} = \frac{U_k}{I_k} \angle \theta$$

$$Z_{e\varphi} = \frac{13,2}{6} \angle 75,3^\circ \Rightarrow Z_{e\varphi} = 2,2 \angle 75,3^\circ \Rightarrow$$

$$Z_{e\varphi} = 0,558 + j 2,128 \Omega$$

$$R_{e\varphi} = 0,558 \Omega$$

$$X_{e\varphi} = j 2,128 \Omega$$

Eğerler derre sekonderde istenmiş.

$$a = \frac{220}{110} = 2.$$

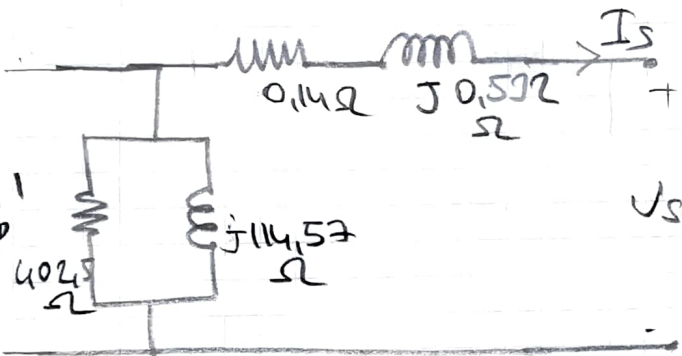
$$R_{es}' = \frac{0,558}{4} = 0,14 \Omega$$

$$X_{ep}' = \frac{j2,128}{4} = j0,532 \Omega$$

$$R_c' = \frac{1610}{4} = 402,5 \Omega$$

$$X_m' = j \frac{458}{4} = j114,57 \Omega$$

b) Sekonder taraftaki eşdeğer derre:



$$\theta = \cos^{-1}(0,8)$$

$$\theta = 36,87^\circ$$

$$I_s = \frac{2000}{110} = 18,18 \text{ A}$$

Akım gücü: $P_{\text{akış}} = S \cdot \cos \theta$

$$P_{\text{akış}} = 2000 \cdot 0,8 = 1600 \text{ W}$$

Kayıplar:

Bakır kayıpları: $P_{\text{kayıp bakır}} = I_s^2 \cdot R_{es}' = 18,18^2 \cdot 0,14 = 46,29 \text{ W}$

Demir kayıpları için öncelikle primer taraftaki I_c akımı sekondere indirgenmiş değerini bulmalıyız.

$$I_c' = a \cdot I_c = 2 \cdot 0,136 = 0,272 \text{ A}$$

$$P_{\text{kayıp demir}} = I_c'^2 \cdot R_c = (0,272)^2 \cdot 402 = 29,75 \text{ W}$$

$$\text{Verim} = \eta = \frac{1600}{1600 + 46,29 + 29,75} \times 100 = 95,46\%$$