ODSEK ZA MEHATRONIKU

KTET

Katedra za teorijsku elektrotehniku
www.ktet.ftn.ns.ac.yu

Ispit iz Osnova Elektrotehnike 2

datum

06.09.2008.

Studenti koji polažu	Rade zadatak	Rade teorijska pitanja	Vreme za rad
I kolokvijum	1		1,5 sati
II kolokvijum	2		1,5 sati
Ceo ispit	1 i 2		3 sata
Za pozitivnu ocenu student mora da uradi najmanje 50% zadataka, pri čemu na svakom zadatku mora da osvari najmanje 8 poena (od mogućih 25) i najmanje 50% teorijskih pitanja.			

Zadaci

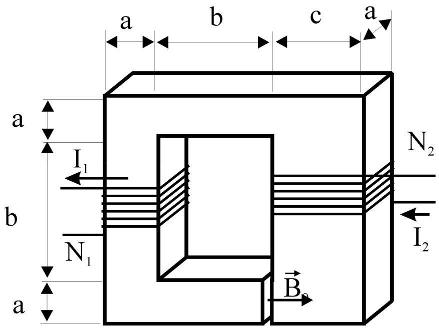
1. Na slici 1a je prikazano magnetno kolo sa vazdušnim procepom širine l_0 = 1mm, načinjen od feromagnetskog materijala čija je kriva prvobitnog magnetisanja prikazana na slici 1b.

   a) Izračunati potrebnu jačinu struje I_1 kroz namotaj N_1 tako da intezitet vektora magnetske indukcije u procepu bude B_0=1T,

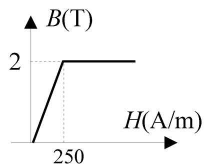
   b) izračunati energiju sadržanu u feromagnetskom jezgru,

   c) izračunati energiju sadržanu u vazdušnom procepu.

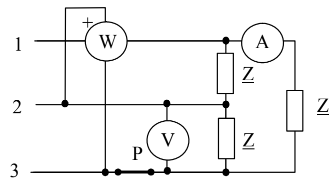
   Parametri jezgra su a = 1cm, b = 3cm, c = 2cm, N_1 = 200, N_2 = 300, I_2 = 1A, ($\mu_0 = 4\pi 10^{-7}$ H/m).



Slika 1a



Slika 1b



Slika 2

2. U kolu na slici 2 odrediti pokazivanje idealnih mernih instrumenata pre i posle otvaranja prekidača P.
   $\underline{Z}$=(90+j210)Ω, $u_{12}(t) = 380\sqrt{2}\cos(314t)V$

O D S E K Z A M E H A T R O N I K U

K T E T

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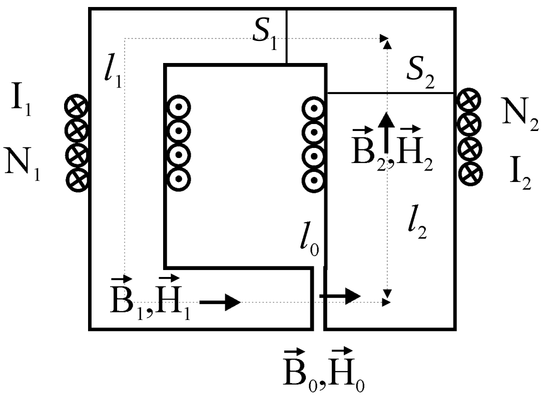
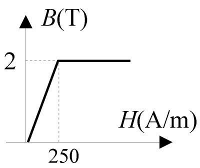
Rešenje ispita iz Osnova Elektrotehnike 2

datum 06.09.2008.

1 a = 1cm, b = 3cm, c = 2cm, l_0 = 1mm, N_1 = 200, N_2 = 300, I_2 = 1A, ($\mu_0 = 4\pi 10^{-7}$ H/m), B_0 = 1T





$$\mu = \frac{\Delta B}{\Delta H} = \frac{2}{250} H/m$$

$$l_1 = 3b + 2a + c = 13cm$$

$$l_2 = b + a = 4cm$$

1) $B_1 = B_0 = 1T$

2) $B_1 S_1 = B_2 S_2 \Rightarrow B_1 S_1$

3) $H_0 = \frac{B_0}{\mu_0} = 796{,}18\ kA/m$

4) $H_1 = \frac{B_1}{\mu} = 125 A/m$

5) $H_2 = \frac{B_2}{\mu} = 62{,}5 A/m$

6) $H_1 l_1 + H_0 l_0 + H_2 l_2 = N_1 I_1 + N_2 I_2$

6) $16{,}25 + 796 + 2{,}5 = 200 I_1 + 300, \quad \Rightarrow I_1 = 2{,}57A$

$$W_{mj} = \int \omega dv = \frac{1}{2} B_1 H_1 S_1 l_1 + \frac{1}{2} B_2 H_2 S_2 l_2 = 937{,}5\ \mu J$$

$$W_{m0} = \int \omega dv = \frac{1}{2} B_0 H_0 l_0 S_1 = 40mJ$$

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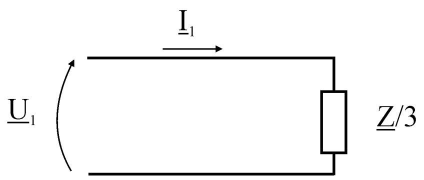
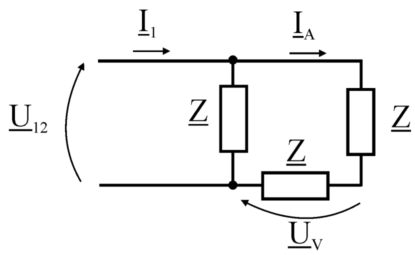
2. $\underline{Z}$=(90+j210)Ω, $u_{12}(t) = 380\sqrt{2}\cos(314t) V$





$$\underline{I}_1 = \frac{\underline{U}_1}{\underline{Z}/3} = \frac{220e^{-j30}V}{(30 + j70)} = 2{,}88e^{-j97}A$$

$$I_A = \frac{|\underline{I}_1|}{\sqrt{3}} = 1{,}66A$$

$$U_V = |\underline{U}_{23}| = 380V$$

$$P_W = \mathrm{Re}\{\underline{U}_{23} \cdot \underline{I}_1^*\} = 380 \cdot 2{,}88 \cdot \cos(-120 + 97)$$
$$= 1006W$$

$$I_A = \frac{|\underline{U}_{12}|}{2|\underline{Z}|} = \frac{380}{2 \cdot 228} = 0{,}833A$$

$$\underline{I}_{12} = \frac{\underline{U}_{12}}{2\underline{Z}/3} = \frac{380}{2 \cdot 228e^{j67}/3} = 2{,}5e^{-j67}A$$

$$U_V = |\underline{I}_A| \cdot |\underline{Z}| = 190V$$

$$P_W = \mathrm{Re}\{\underline{U}_{23} \cdot \underline{I}_{12}^*\} = 380 \cdot 2{,}5 \cdot \cos(-120 + 67)$$
$$= 569W$$