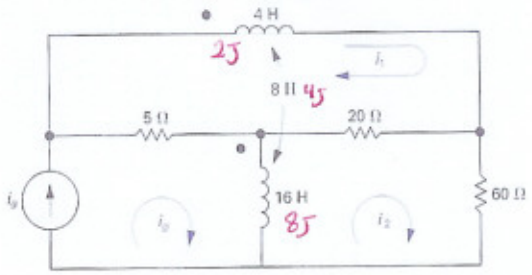
Serial #

King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE205: Electric Circuits II (031)
Quiz 7

Name: KEY ID# Sec 01

a) What is the coefficient of coupling?

b) Assume that the physical structure of these coupled coils is such that $\mathcal{P}_1 = \mathcal{P}_2$ (permeance1 = permeance 2). What is the turns ratio N_1 / N_2, if N_1 is the number of turns on the 4H coil?



c) Write a set of mesh-current equations that describe the ciruit in terms of the currents i_1 and i_2 in the frequency domain, where the source current is known and it has ω=0.5 rad/s. (Hint: first represent in the $j\omega$ domain)

a) $M = k\sqrt{L_1 L_2} \Rightarrow k = \dfrac{M}{\sqrt{L_1 L_2}} = \dfrac{8}{\sqrt{4*16}} = 1$

b) $L_1 = N_1^2 \mathcal{P}_1$, $L_2 = N_2^2 \mathcal{P}_2$

$$\frac{L_1}{L_2} = \frac{N_1^2 \mathcal{P}_1}{N_2^2 \mathcal{P}_2} \Rightarrow \frac{N_1}{N_2} = \sqrt{\frac{4}{L_2}} = \sqrt{\frac{4}{16}} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$

c) $j\omega L_1 = j(0.5)(4) = 2j$

$j\omega L_2 = j(0.5)(16) = 8j$

$j\omega M = j(0.5)(8) = 4j$

$$20(i_1 - i_2) + 5(i_1 - i_3) + 2j i_1 + 4j(i_3 - i_2) = 0$$

$$60 i_2 + 8j(i_2 - i_3) - 4j i_1 + 20(i_2 - i_1) = 0$$

Good Luck,
Dr. Ali Muqaibel