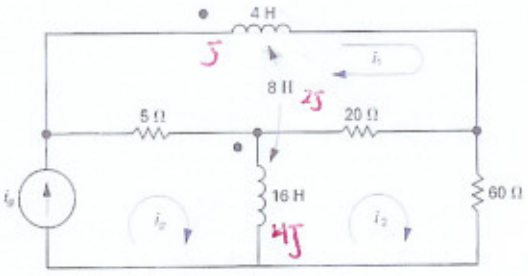
King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE205: Electric Circuits II (031)
Quiz 7

Serial #

Name: KEY Sec 02

a) What is the coefficient of coupling?

b) Assume that the physical structure of these coupled coils is such that $P_1 = P_2$, (permeance1 = permeance 2). What is the turns ratio N_2/N_1, if N_1 is the number of turns on the 4H coil?



c) Write a set of mesh-current equations that describe the circuit in terms of the currents i_1 and i_2 in the frequency domain, where the source current, i_g, is known and it has ω=0.25 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) $L_1 = N_1^2 \mathcal{P}_1$, $L_2 = N_2^2 \mathcal{P}_2$

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

c) $J\omega L_1 = J(0.25)(4) = J$

$J\omega L_2 = J(0.25)(16) = 4J$

$J\omega M = J(0.25)(8) = 2J$

$20(i_1 - i_2) + 5(i_1 - i_g) + J i_1 + 2J(i_g - i_2) = 0$

$60 i_2 + 4J(i_2 - i_g) - 2J i_1 + 20(i_2 - i_1) = 0$

Good Luck,
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