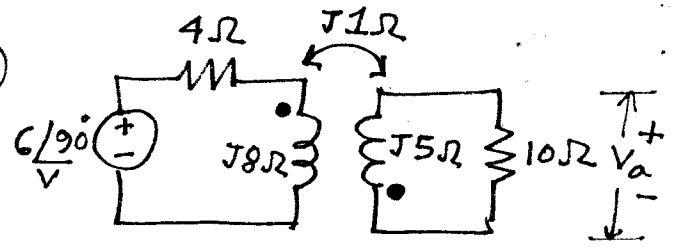
Tutorial 7: MAGNETICALLY COUPLED CIRCUITS

(1)



Determine the voltage V_a across the 10Ω resistance

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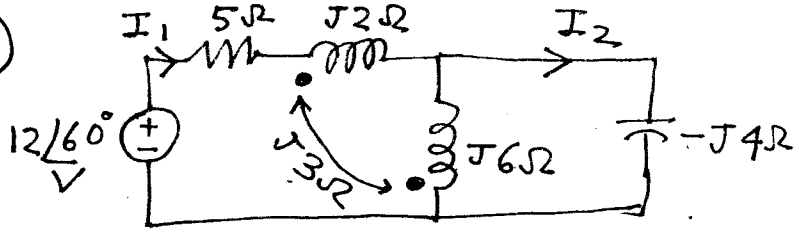
(2)



Determine the phasor currents I_1 and I_2

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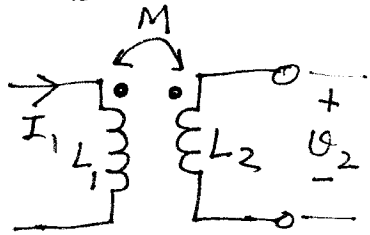
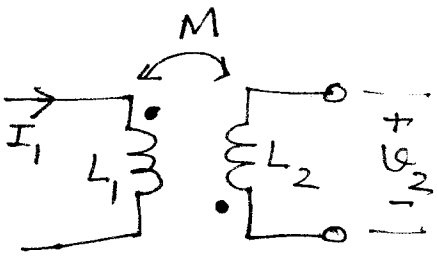
(3) Assuming M = 10H, coil L_2 is open-circuited, and $i_1 = -2e^{-5t}$ A, Find the voltage v_2 for the following circuits

(a)



(b)



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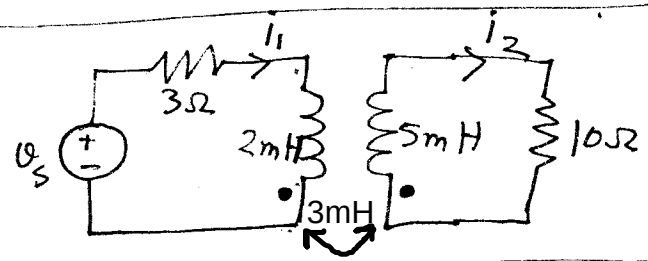
(4)



write the appropriate mesh equations for the given circuit.

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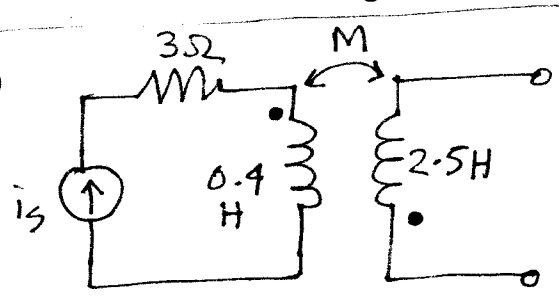
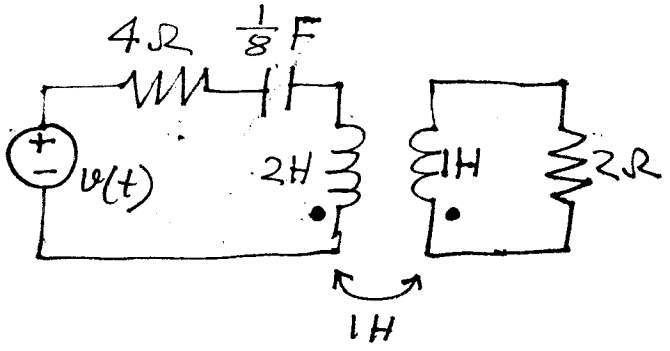
(5)



Let $i_s = 2\cos(10t)$ A. $k = 0.6$. Find the total energy stored in the passive network at $t = 0$ if (a) secondary is open-circuited (b) secondary is shorted.

(6)



$v(t) = 20\cos(2t)$ V. Determine the coupling coefficient and the energy stored in the coupled inductors at $t = 1.55$.

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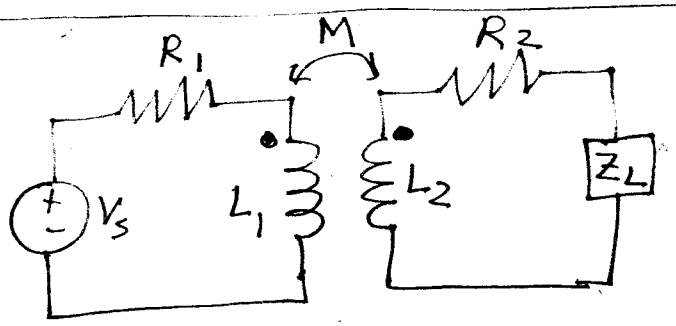
(7)



$R_1 = 3\Omega$, $R_2 = 6\Omega$, $L_1 = 2$mH, $L_2 = 10$mH, $M = 4$mH. If $\omega = 5000$ rad/s, Find Z_{in} (input impedance - as seen from the primary side) for Z_L equal to (a) 10Ω (b) $j20\Omega$ (c) $10 + j20\Omega$ (d) $-j20\Omega$

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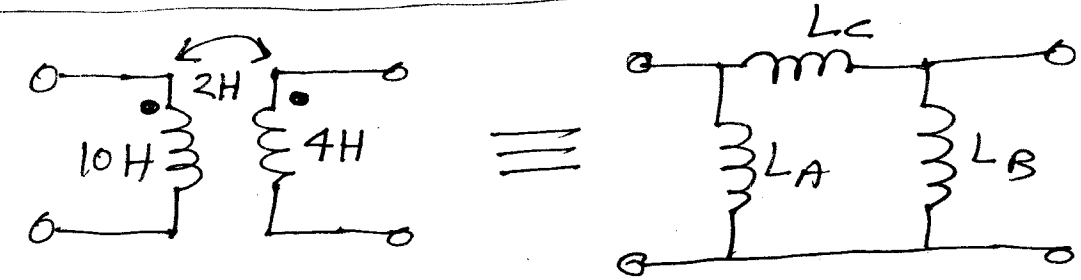
(8)



For the transformer shown on the left find the parameters of its π equivalent circuit (shown on the right), i.e. find L_A, L_B & L_c.

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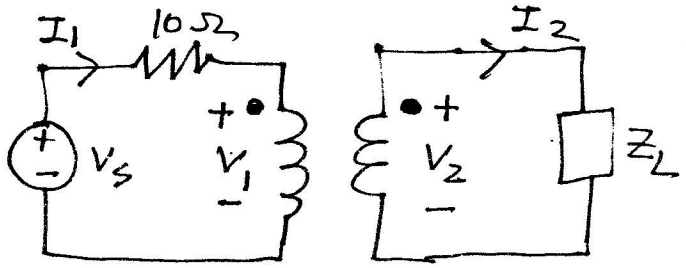
(9) Solve the problem in question 1, using the T equivalent ckt of the coupled inductors.

(10)



Let $N_1 = 1000$ turns
$N_2 = 5000$ turns. in the ideal transformer shown in the figure.

If $Z_L = 500 - j400\,\Omega$ find the average power delivered to Z_L for (a) $I_2 = 1.4\angle 20^\circ$ A rms (b) $V_2 = 900\angle 40^\circ$ V rms (c) $V_1 = 80\angle 100^\circ$ V rms (d) $I_1 = 6\angle 45^\circ$ A rms (e) $V_s = 200\angle 0^\circ$ V rms.

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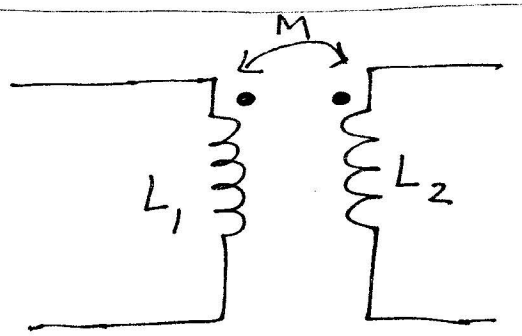
(11)



$L_1 = 3H$
$L_2 = 12H$
$M = 5H$
number of primary turns = 1000
number of secondary turns = 4000
primary coil resistance = $1\,\Omega$
secondary coil resistance = $4\,\Omega$

Draw the equivalent circuit of the transformer
(a) referring to primary side
(b) referring to the secondary side

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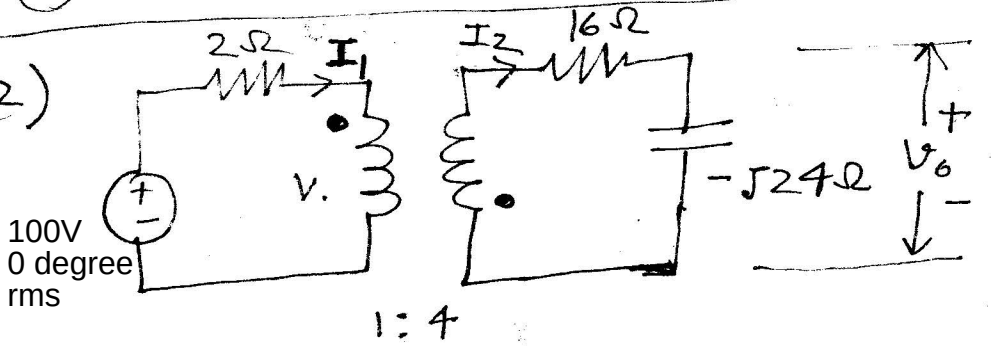
(12)



Find V_o. Calculate the complex power supplied by the source.

Assume the transformer to be ideal.