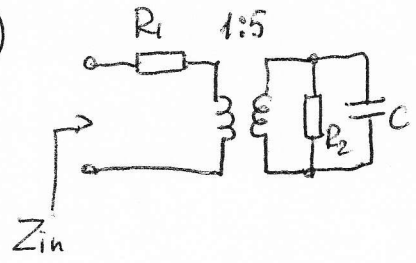
Circuits & systems – tutorials no 7

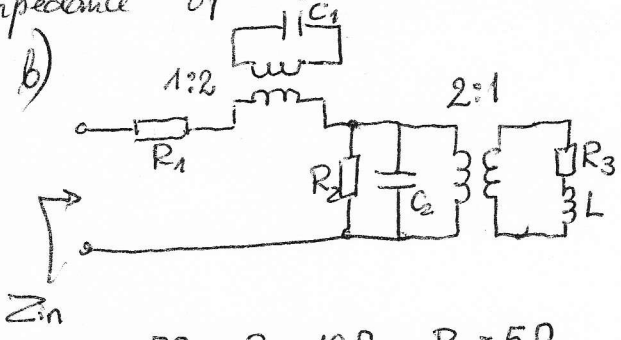
1. Calculate the input impedance of the circuit

a)



$R_1 = 10\Omega$, $R_2 = 50\Omega$, $\frac{1}{\omega C} = 100\Omega$

b)

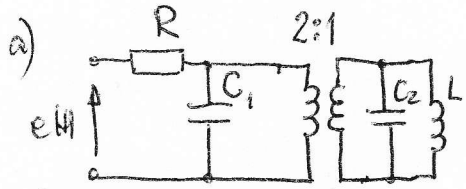


$R_1 = 5\Omega$, $R_2 = 10\Omega$, $R_3 = 5\Omega$

$\frac{1}{\omega C_1} = 20\Omega$, $\frac{1}{\omega C_2} = 10\Omega$, $\omega L = 10\Omega$

2. Calculate currents in the circuit

a)

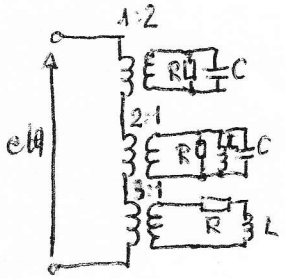


$e(t) = 20\sqrt{2}\sin(\omega t + 90°)$

$R = 5\Omega$, $\omega L = 10\Omega$

$\frac{1}{\omega C_1} = 10\Omega$, $\frac{1}{\omega C_2} = 5\Omega$

b)



$R = 10\Omega$

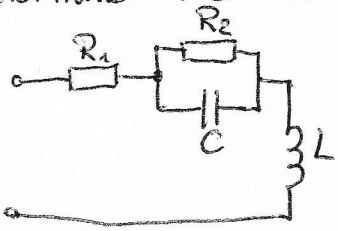
$\frac{1}{\omega C} = 10\Omega$

$\omega L = 20\Omega$

$e(t) = 50\sqrt{2}\sin(\omega t)$

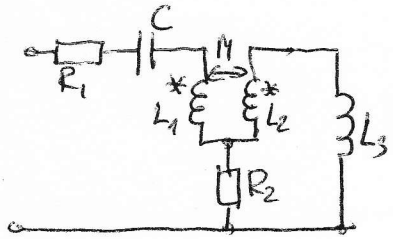
3. Determine the resonance frequency of the circuit

a)



$R_1 = 5\Omega$, $R_2 = 10\Omega$, $L = 1H$, $C = 0.5F$

b)



$R_1 = 10\Omega$

$C = 1F$

$L_1 = 2H$

$L_2 = 3H$

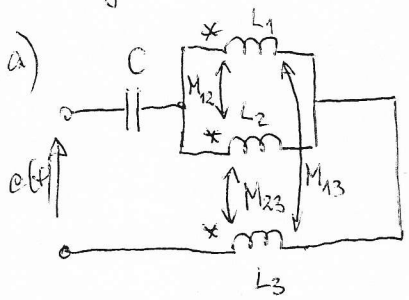
$M = 1H$

$R_2 = 1\Omega$

$L_3 = 1H$

4. Adjust value of C in the circuit to get the resonance state at $\omega_r = 5000\frac{rad}{s}$ (a) at $\omega_r = \omega = 500000\frac{rad}{s}$ (b)

a)



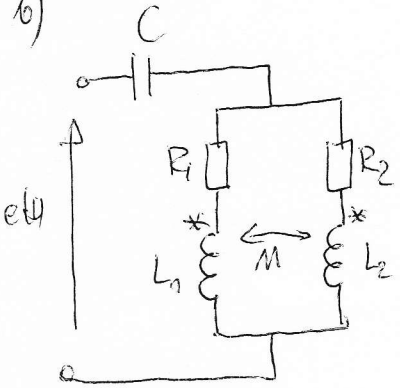
$L_1 = 4mH$ $M_{12} = 2mH$

$L_2 = 6mH$ $M_{23} = 2{,}4mH$

$L_3 = 3{,}6mH$ $M_{13} = 1mH$

Calculate currents & voltages of coils if $e(t) = 100\sqrt{2}\sin(\omega_r t)$

b)



$e(t) = 50\sqrt{2}\sin(500\cdot10^3 t)$

$R_1 = R_2 = 100\Omega$

$L_1 = 0{,}1mH$

$L_2 = 0{,}2mH$

$M = 0{,}1mH$

Calculate currents in the resonant state