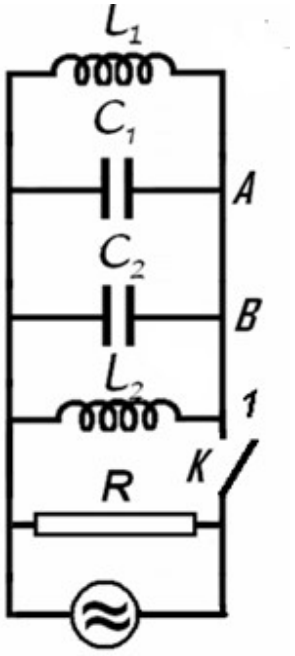
Electricity – Problem II (8 points)

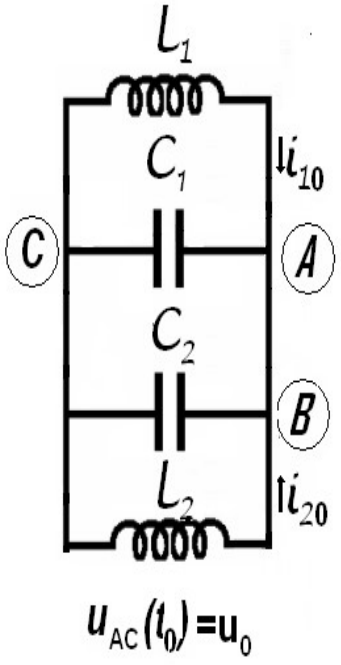
Different kind of oscillation



Let's consider the electric circuit in the figure, for which $L_1 = 10\ mH$, $L_2 = 20\ mH$, $C_1 = 10\ nF$, $C_2 = 5\ nF$ and $R = 100\,k\Omega$. The switch K being closed the circuit is coupled with a source of alternating current. The current furnished by the source has constant intensity while the frequency of the current may be varied.

a. Find the ratio of frequency f_m for which the active power in circuit has the maximum value P_m and the frequency difference $\Delta f = f_+ - f_-$ of the frequencies f_+ and f_- for which the active power in the circuit is half of the maximum power P_m.

The switch K is now open. In the moment t_0 immediately after the switch is open the intensities of the currents in the coils L_1 and $i_{01} = 0{,}1\ A$ and $i_{02} = 0{,}2\ A$ L_1 (the currents flow as in the figure); at the same moment, the potential difference on the capacitor with capacity C_1 is $u_0 = 40V$:



b. Calculate the frequency of electromagnetic oscillation in $L_1C_1C_2L_2$ circuit;

c. Determine the intensity of the electric current in the AB conductor;

d. Calculate the amplitude of the oscillation of the intensity of electric current in the coil L_1.

Neglect the mutual induction of the coils, and the electric resistance of the conductors. Neglect the fast transition phenomena occurring when the switch is closed or opened.