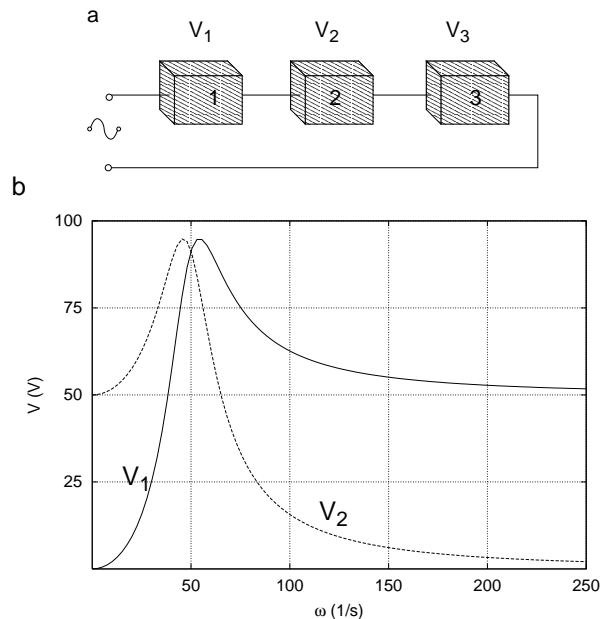
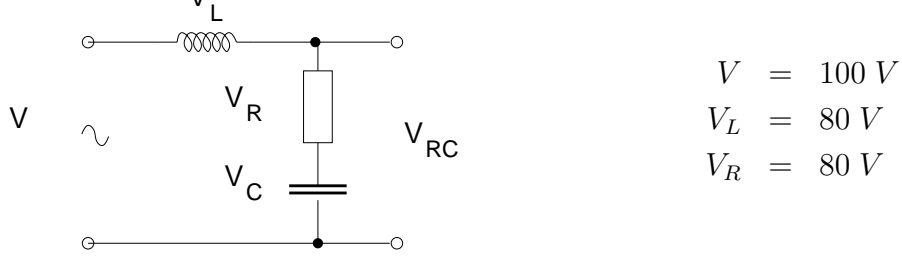


## Problems

- The power of a lamp which is connected to the power line is  $P = 100 \text{ W}$ . The effective voltage of the power line is  $V_{eff} = 230 \text{ V}$  and its frequency is  $f = 50 \text{ Hz}$ . How large capacitor should we connect serially to the lamp in order to decrease its power to  $40 \text{ W}$ ? 20 points
- There are three boxes serially connected as it is shown by the Fig. **a**. The boxes contain a resistor or a capacitor or a coil. The voltages can be measured on the first and on the second boxes as the function of the angular frequency is shown by Fig. **b**.



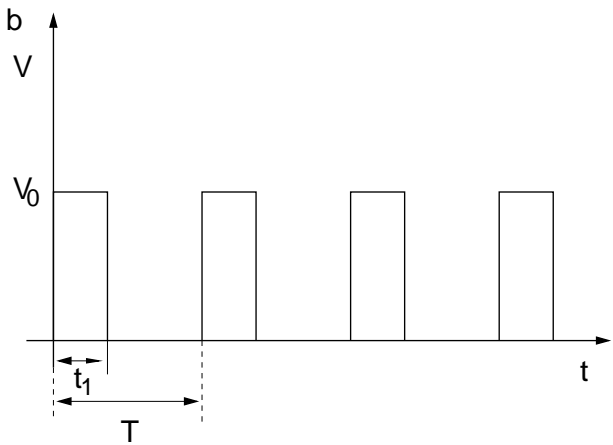
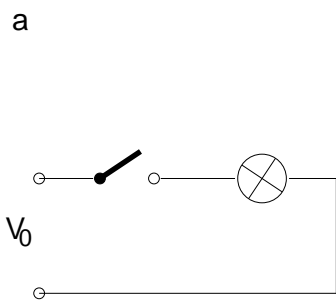
- Which box contains the resistors, which contains the coil and which one contains the capacitor? 7 points
  - How large is the voltage of the power supply? 6 points
  - Give the resonance frequency of the system! 7 points
  - Draw the schematic graph of  $V_3$ !
- In a serially connected RLC system the voltage on the resistor is  $V_R = 100 \text{ V}$  and the voltage on the inductor is  $V_L = 150 \text{ V}$ . It is connected to a generator supplying a voltage of  $V = 100 \text{ V}$  and the power dissipated on the system is  $P = 100 \text{ W}$ . All the voltages given above are amplitudes.
    - Give the voltage on the capacitor! 5 points
    - Give the resistance of the resistor and the reactance of the inductor and the capacitor! 5 points
    - How much power will be dissipated on the system if the frequency of the voltage is 10 points doubled?



5. If the switch is on in Fig.a the power dissipated on the lamp is  $P = 75 \text{ W}$ . We turn the switch periodically on and off in order to decrease the power of the lamp. The voltage on the lamp is shown on Fig. b.  $V_0 = 100 \text{ V}$

a.) Give  $t_1$  if the power of the lamp is  $P_1 = 25 \text{ W}$  and  $T = 10^{-3} \text{ s}$  10 points

b.) How large is the effective voltage on the lamp in that case? 10 points



0 - 40 : 1	41 - 55 : 2	56 - 70 : 3	71 - 85 : 4	85 - 100 : 5
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