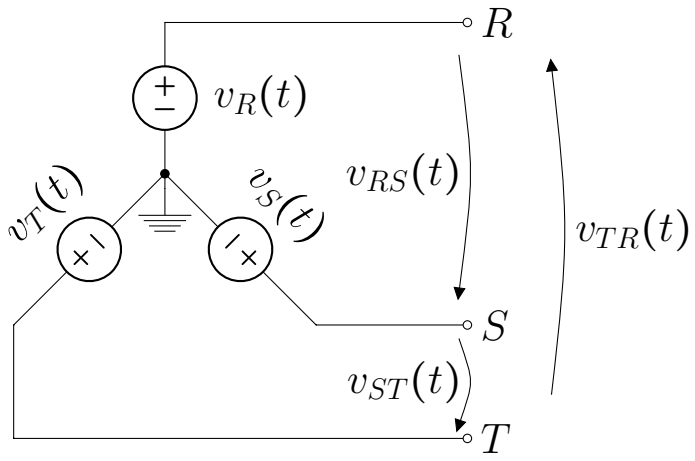
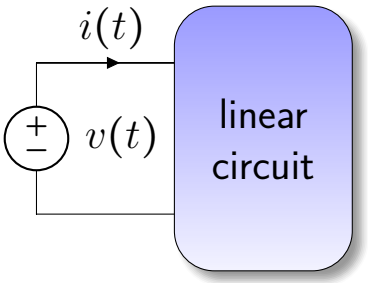
Seminar - 7th week

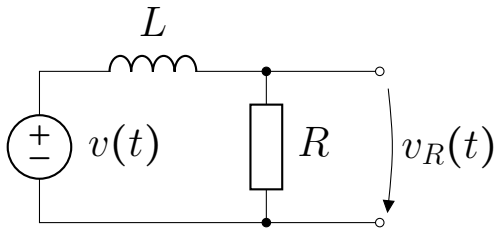
1. In the circuit below calculate voltages $v_{RS}(t)$, $v_{ST}(t)$ and $v_{TR}(t)$, if $v_R(t) = V_m \sin(\omega t)$ V, $v_S(t) = V_m \sin(\omega t + \frac{2\pi}{3})$ V, $v_T(t) = V_m \sin(\omega t - \frac{2\pi}{3})$ V, $f = 50$ Hz. RMS value of all source voltages is $V = 230$ V. In Matlab, draw waveforms of all voltages.



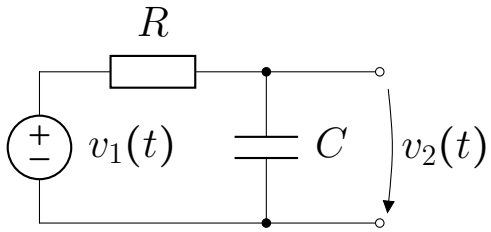
2. Convert the following voltage functions to phasors: $v_1(t) = 81.06 \sin(1000t)$, $v_2(t) = -9 \sin(3000t)$, $v_3(t) = -1.65 \sin(5000t)$. Is possible make a sum of voltage phasors in the same way as in the previous task? Simulate the waveform of total voltage in Microcap simulator (or draw it in Matlab), when these three voltage sources are series connected.
3. The voltage across terminals of a linear circuit is $v(t) = 30 \sin(\omega t + \frac{\pi}{6})$, through circuit flows the current $i(t) = 0.2 \sin(\omega t + \frac{\pi}{3})$.
   a) Calculate impedance of the circuit.
   b) Of which circuit elements (resistor / capacitor / inductor) this circuit may consist? Find value of their resistivity / capacitance / inductance, if the frequency of the source is $f = 177$ Hz.



4. The RMS voltage on the resistor is V_R = 50 V and source RMS voltage is V = 100 V. Power dissipation on resistor is P = 25 W, frequency is f = 50 Hz. Calculate:
   a) RMS voltage on inductor V_L,
   b) inductance L,
   c) waveform of voltage on resistor $v_R(t)$.



5. For the circuit in the figure below calculate frequency at which the phase shift between output and input voltage will be 60°. R = 1 kΩ, C = 1 µF.



6. Find an impedance $\mathbf{Z}$ of the two-terminal in the figure below. R = 1 kΩ, C = 1 µF, $A = -5\,[-]$, $v_c(t) = Av_x(t)$.