

Homework 5

Due date: 17th, Nov.

Turn in your homework in class

Rules:

- Work on your own. Discussion is permissible, but extremely similar submissions will be judged as plagiarism.
- Please show all intermediate steps: a correct solution without an explanation will get zero credit.
- Please submit on time. No late submission will be accepted.
- Please prepare your submission in English only. No Chinese submission will be accepted.

1. Given that the voltage and current of two-terminal elements adopt the passive sign convention, the instantaneous values are expressed as:

(1) $v(t) = 15\cos(400t + 30^\circ) \text{ V}$, $i(t) = 3\sin(400t + 30^\circ) \text{ A}$;

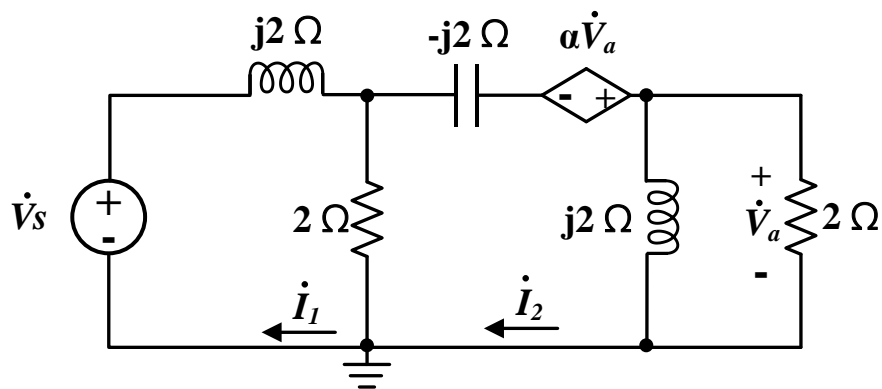
(2) $v(t) = 8\sin(500t + 50^\circ) \text{ V}$, $i(t) = 2\sin(500t + 140^\circ) \text{ A}$;

(3) $v(t) = 8\cos(250t + 60^\circ) \text{ V}$, $i(t) = 5\sin(250t + 150^\circ) \text{ A}$;

(a) Transform the three voltage & current pairs into phasors.

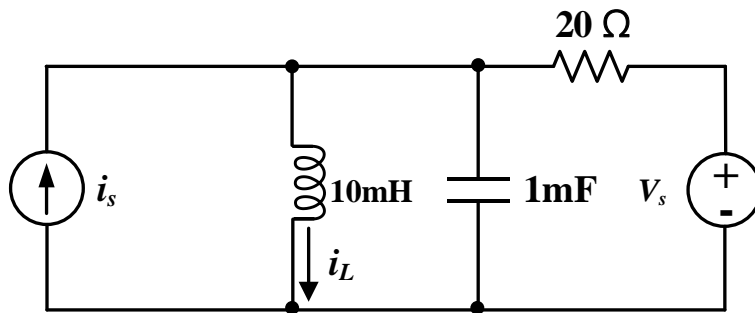
(b) Try to determine whether the element is a resistor, inductor or capacitor, and determine its value ($R=?$, $C=?$, $L=?$) for **(1), (2), and (3), respectively**.

2. Use nodal **AND** mesh analyze method to find \dot{V}_a , \dot{I}_1 and \dot{I}_2 for the circuit below, assuming that $\dot{V}_s = 10 \angle 0^\circ \text{ V}$, $\alpha = 0.5$.

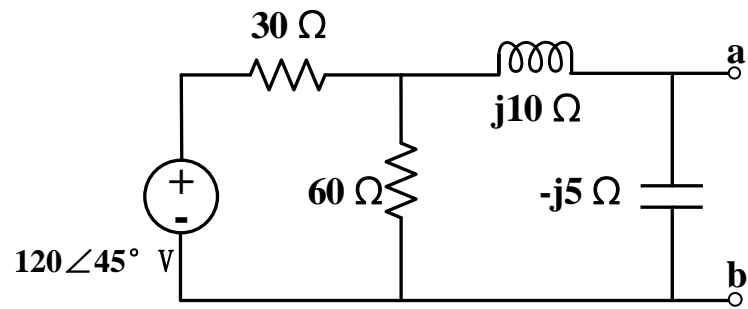


3. Using superposition method to find $i_L(t)$, assuming that $i_s(t) = 10\sqrt{2}\cos 100t$ A,

$$v_s(t) = 100\sqrt{2}\cos 1000t \text{ V}$$



4. For the circuit below, please find the Thevenin equivalent circuit with respect to node **a** and node **b**.



5. As shown in the figure, $V_g = 20\cos(5000t)$ V. Please find the steady state expression for $V_a(t)$. The operational amplifier works in its linear region.

