

Homework 6

Due date: Dec. 14th, 2023

Turn in your hard-copy hand-writing 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) $v(t) = 15\cos(400t + 30^\circ) \text{ V}$, $i(t) = 3\sin(400t + 30^\circ) \text{ A}$;

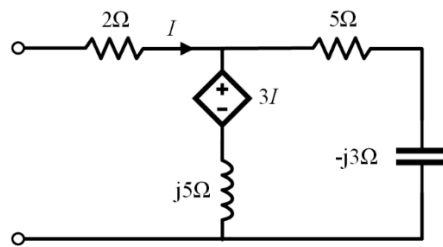
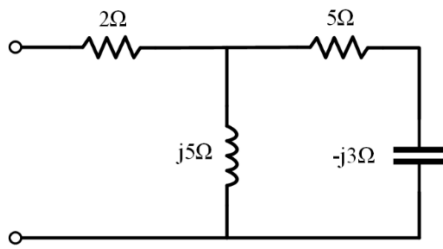
(2) $v(t) = 8\sin(500t + 50^\circ) \text{ V}$, $i(t) = 2\sin(500t + 140^\circ) \text{ A}$;

(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.

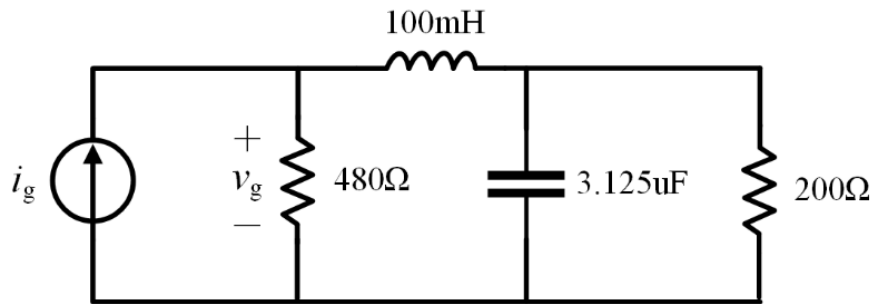
(b) Try to determine whether the element is a resistor, inductor or capacitor, and determine its value ($R=?$, $C=?$, $L=?$) for **(1), (2), and (3), respectively**.

2. Find the equivalent impedance for the following **two** circuits.

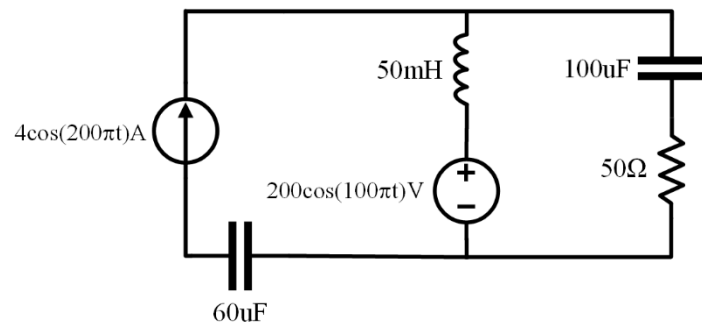


3. Given $i_g = 60\cos(\omega t)$ mA.

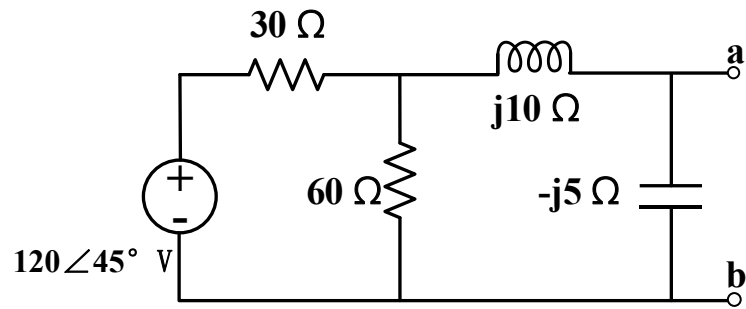
If i_g is in phase with v_g , calculate the angular frequency of the current source and find the expression for v_g .



4. Use superposition method to find the **Time Domain** voltage expression for the resistor.



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



6. Use **nodal or mesh** methods to find \dot{V}_a , \dot{I}_1 and \dot{I}_2 for the circuit below, assuming that $\dot{V}_S = 10 \angle 0^\circ \text{ V}$, $\alpha = 0.5$.

