

## Homework 6

Due time: 10 p.m. Dec. 12<sup>th</sup>, 2024

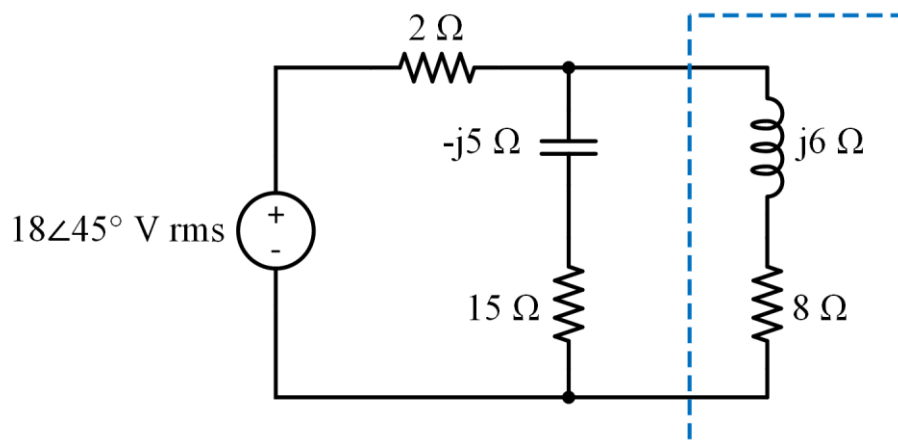
Turn in your hard-copy hand-writing homework at the entrance of  
Room 3-324 SIST #3 Building.

Rules:

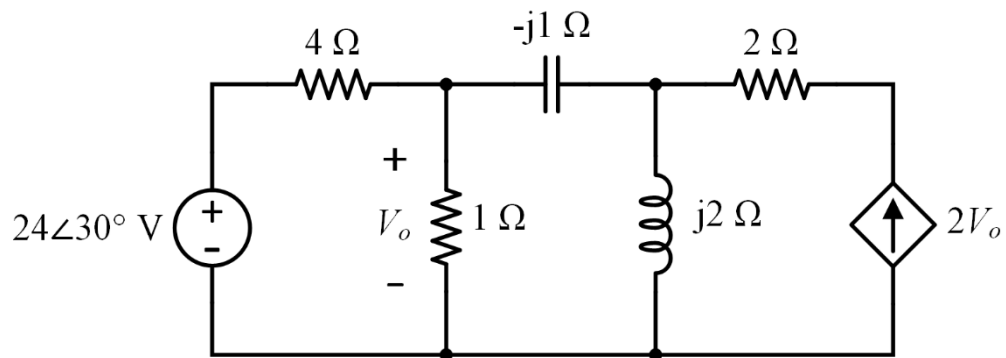
- Work on your own. Discussion is permissible, but extremely similar submissions will be judged as plagiarism.
- Please show all intermediate steps: a correct solution without an explanation will get zero credit.
- Please submit on time. No late submission will be accepted.
- Please prepare your submission in **English only**. No Chinese submission will be accepted.
- All final answers must be rounded to **two decimal places**, and include the **appropriate units**.

1. For the given circuit where  $V_{in} = 18\angle 45^\circ \text{ V rms}$ , determine the following:
  - a. Complex power, Average power, Reactive power, Apparent power delivered by the source;
  - b. Complex power, Average power, Reactive power, Apparent power absorbed by the series-connected impedance  $(8+j6 \Omega)$  in the dotted box.

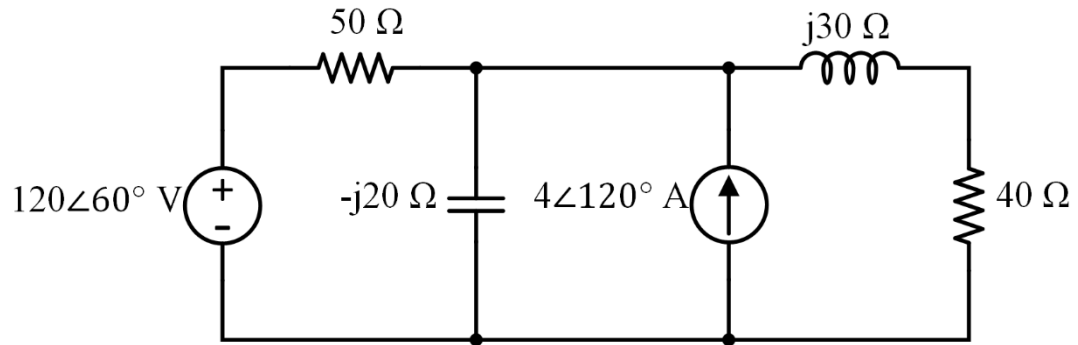
Please specify the units for the calculated power values (choose from VA, W and VAR).



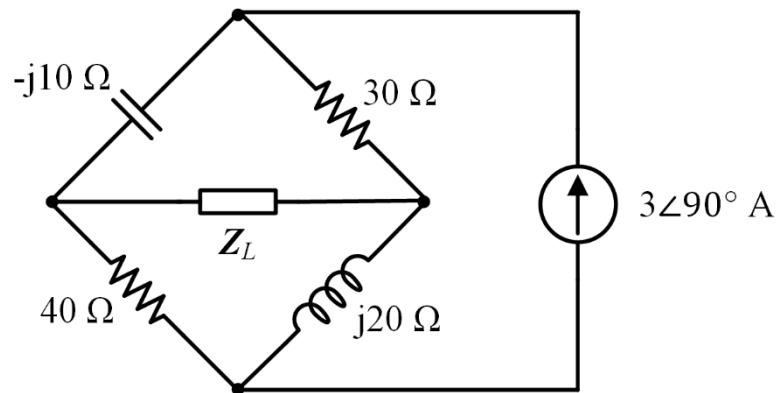
2. For the circuit shown below,  $V_{in} = 24\angle 30^\circ \text{ V rms}$ . Use Thevenin method to simplify the circuit and then determine the average power, reactive power and complex power delivered by the voltage source.



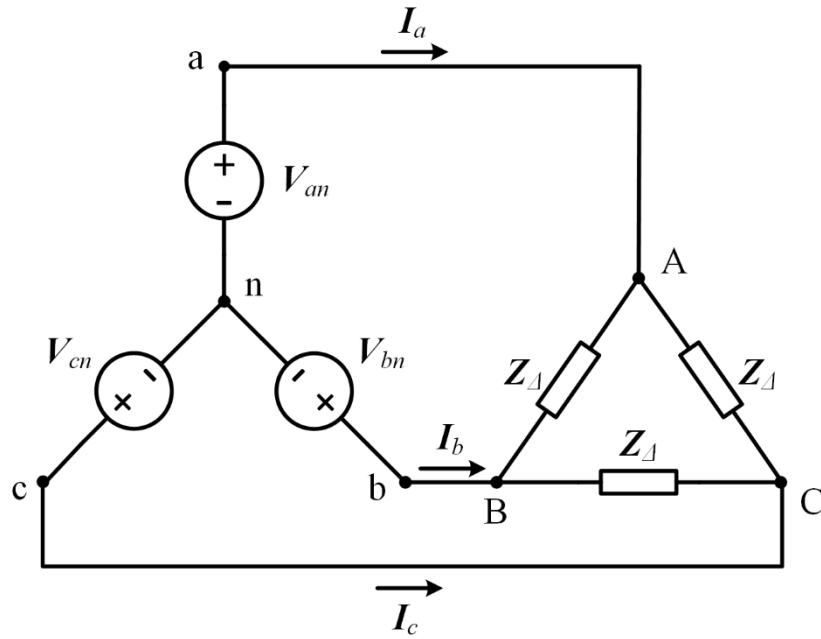
3. For the circuit below,  $V = 120\angle 60^\circ \text{ V rms}$ ,  $I = 4\angle 120^\circ \text{ A rms}$ .  
Find the reactive power absorbed by the capacitor and inductor.



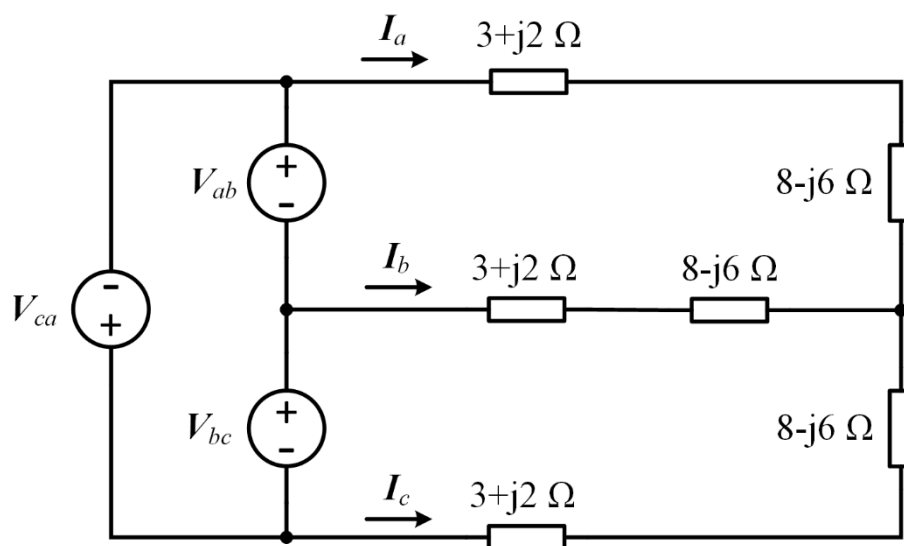
4. For the circuit shown below,  $I_s = 3\angle 90^\circ \text{ A rms}$ . Determine the following:
- (a) The expression of  $Z_L$  that could maximize the average power delivered to  $Z_L$ .
  - (b) The maximum average power absorbed by  $Z_L$ .



5. In the circuit below,  $V_{an} = 440\angle 0^\circ V \text{ rms}$ ,  $V_{bn} = 440\angle -120^\circ V \text{ rms}$ ,  $V_{cn} = 440\angle 120^\circ V \text{ rms}$ ,  $Z_\Delta = (12 + j6) \Omega$ . Find the line currents  $I_a(A)$ ,  $I_b(A)$ ,  $I_c(A)$  and the total complex power absorbed by the whole load.



6. In the circuit below with positive sequence,  $V_{ab} = 120\angle 20^\circ V_{rms}$ . Try to find line currents  $I_a(A)$ ,  $I_b(A)$ ,  $I_c(A)$  and the average power delivered by each voltage source.



7. For the circuit below with positive sequence,

$$V_{ab}(\text{expressed by magnitude}) = 100 \angle -30^\circ \text{ V}, \quad Z_{\Delta} = 21 + 24j \, \Omega$$

Find the total complex power absorbed by the whole load in delta-connection.

