

Homework 6

Due date: Dec.9th, 2021

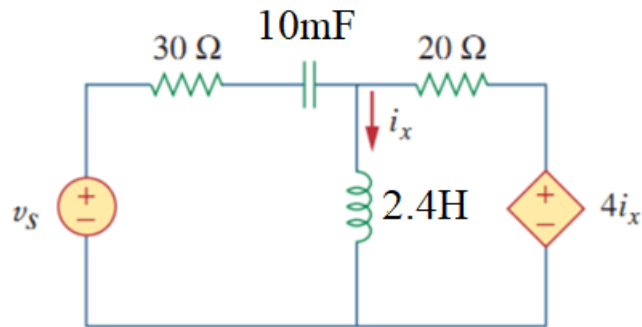
Turn in your homework in class

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.
- If needed, round the number to the nearest hundredths, i.e., rounding it to 2 decimal places.

1. The circuit below is in steady state and $V_s = 40\sin(5t + 15^\circ)V$ in time domain

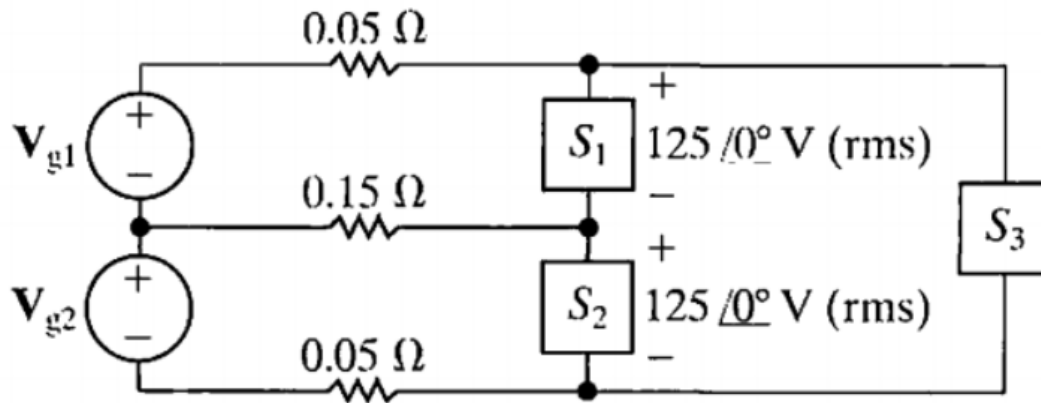
- Calculate $i_x(t)$ in S.S.
- Calculate the **apparent power** on the 10mF capacitor.
- Calculate the **complex power** absorbed by the **controlled source**.



2. Consider the following circuit with three elements S_1 , S_2 and S_3 . The voltages on the S_1 and S_2 are given. The complex power absorbed by S_1 , S_2 and S_3 are

$$S_1 = (10 + j2.5) \text{ kVA}, \quad S_2 = (12.5 + j5) \text{ kVA}, \quad S_3 = 4 \text{ kVA}, \text{ respectively}$$

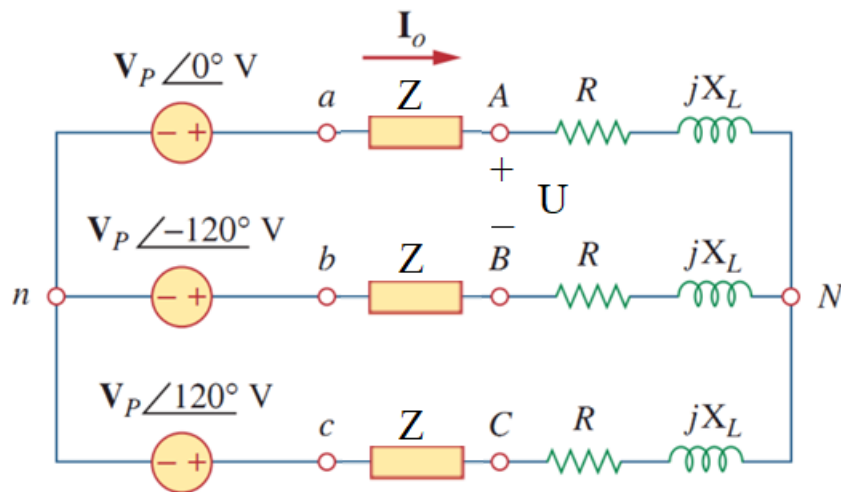
- Find V_{g1} (rms) and V_{g2} (rms).
- Calculate the **complex power** developed by the voltage sources V_{g1} and V_{g2} .
- Prove that the total power dissipated by S_1 , S_2 and S_3 **and the resistors** is equal to the total power developed by **the voltage sources**.



3. Consider the following three-phase circuit. $R=20\Omega$, $X_L=5$, $V_p=50$ (rms).

Line impedance $Z=1+j0.5\Omega$.

- Calculate the **line current I_o** .
- Calculate **the voltage U** shown in the circuit.
- Calculate the total complex power of **all the loads**.



4. The following circuit includes a mutual inductance $M=600\text{mH}$, and is in steady state. Given $i_s = 4\sin(600t)\text{A}$, $v_s = 100\cos(300t + 60^\circ)\text{V}$, calculate $i_x(t)$ in **S.S.**

