

RULES:

- Please try to work on your own. Discussion is permissible, but identical submissions are unacceptable! See “上海科技大学学生学术诚信规范与管理办法”, <http://sist.shanghaitech.edu.cn/cn/NewsDetail.asp?id=782>.
- 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. [10%] A load consisting of a 480Ω resistor in parallel with a $5/9\ \mu\text{F}$ capacitor is connected across the terminals of a sinusoidal voltage source V_g , where $V_g = 240\cos(5000t)\text{V}$.
 - a) What is the peak value of the instantaneous power delivered by the source?
 - b) What is the peak value of the instantaneous power absorbed by the source?
 - c) What is the average power delivered to the load?
 - d) What is the reactive power delivered to the load?
 - e) What is the reactive factor of the load?

2. [10%] Find the average power dissipated in the 30Ω resistor in the circuit seen in Fig 1, if $i_g = 6\cos(20,000t)\text{A}$.

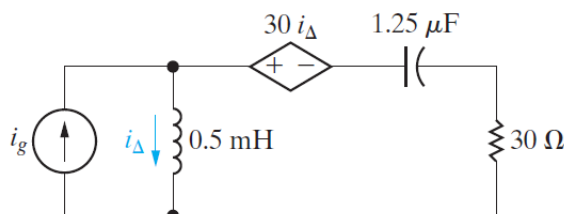


Fig. 1

3. [10%] The op-amp in the circuit shown in Fig. 2 is ideal. Calculate the average power delivered to the $1\text{ k}\Omega$ resistor when $V_g = \cos(1,000t)\text{ V}$.

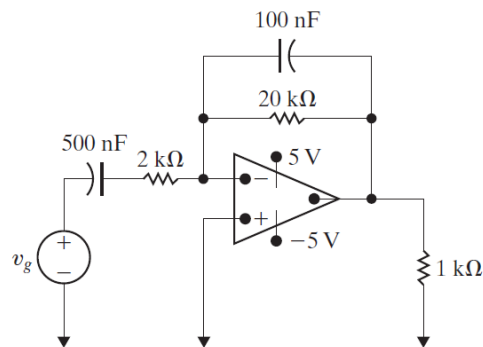


Fig. 2

4. [10%] Find the complex power delivered by v_s to the network in Fig.3. Let $v_s = 100 \cos 2000t\text{ V}$.

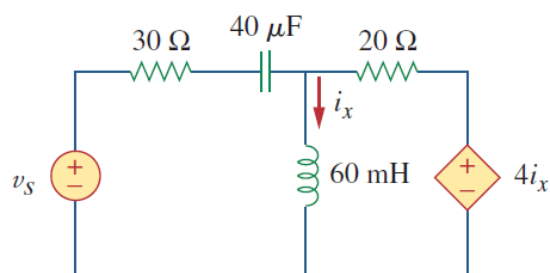


Fig. 3

5. [15%] Given the circuit in Fig. 4, find I_o and the overall complex power supplied.

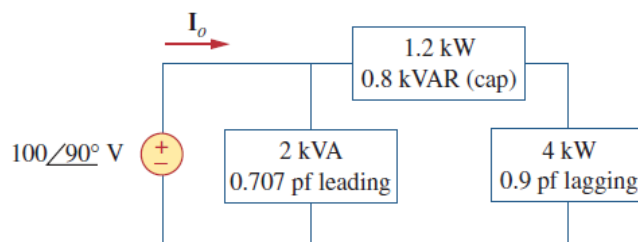
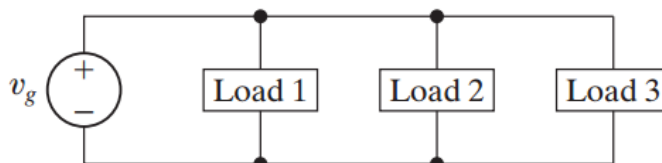


Fig. 4

6. [15%] Load 1 is a 240Ω resistor in series with an inductive reactance of 70Ω ; load 2 is a capacitive reactance of 120Ω in series with a 160Ω resistor; and load 3 is a 30Ω resistor in series with a capacitive reactance of 40Ω . The frequency of the voltage source is 60Hz .
- Give the power factor and reactive factor of each load.
 - Give the power factor and reactive factor of the composite load seen by the voltage source.



7. [15%] Assuming that the load impedance is to be purely resistive, what load should be connected to terminals a - b of the circuits in Fig. 5 so that the maximum power is transferred to the load?

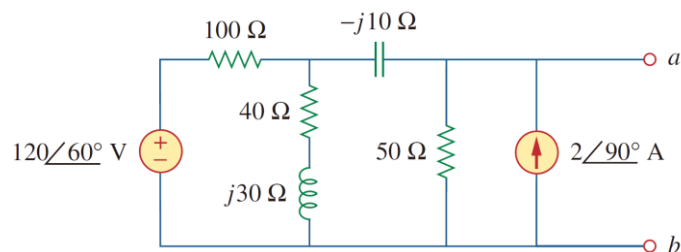


Fig. 5

8. [15%] The load impedance Z_L for the circuit shown in Fig. 6 is adjusted until maximum average power is delivered to Z_L .
- Find the maximum average power delivered to Z_L .
 - What percentage of the total power developed in the circuit is delivered to Z_L ?

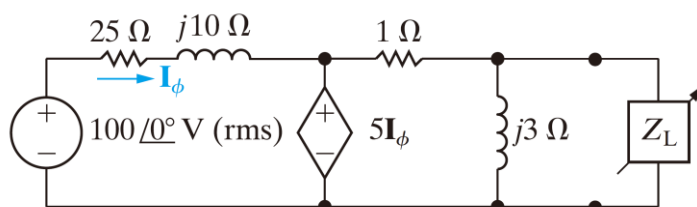


Fig. 6