ECE 35, Fall 2018

Final - Section B

Sequence number	

Grade
/ 50

Last name	
First + middle name(s)	
PID	

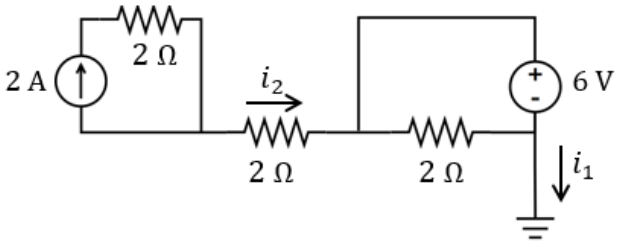
Instructions:

- Do not look at the questions or start writing until it is announced you can do so.
- Read each problem completely and thoroughly before beginning.
- All calculations must be done in your blue book. It should be clear which question they belong to. Answers without supporting calculations will receive zero credit. If you are using intuition, write a short explanation.
- Write clearly and make sure your answer is structured properly. We will not hunt for your work or answers.
- Write your final answers in the answer boxes on these question pages. Make sure you list units!
- You must follow the Final Exam Procedures that were posted on TritonEd. If you are unsure of anything, ask. As a reminder:
    - Your phone should be turned off and put inside your bag in the front of the room (or on the table in the front). If you are found to have a phone (or other communication device) on you during the exam, your exam will not be graded.
    - Calculators are not allowed.
    - This is a closed book exam.

▲

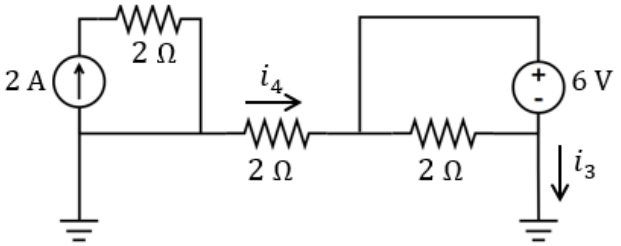
(1) (a) Find the currents i_1 and i_2. *(2 points)*

i_1 i_2

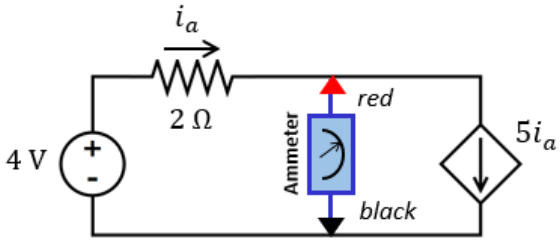


(b) Find the currents i_3 and i_4. *(2 points)*

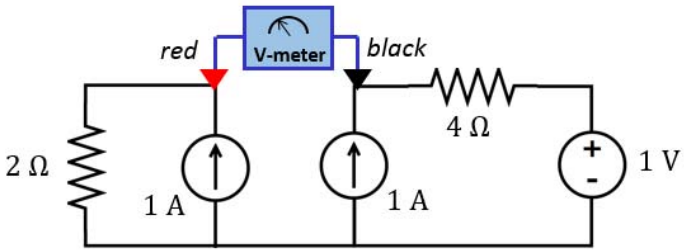
i_3 i_4



(2) (a) What is the ammeter reading? *(2 points)*



(b) What is the volt-meter reading? *(2 points)*



(c) Find the Thevenin equivalent model between a and b for the circuit shown in Fig. A. *(3 points)*

To help you find this model, someone did an experiment for you (shown in Fig. B): they attached a 1 Ω resistor and measured a current of 1 A with the ammeter.

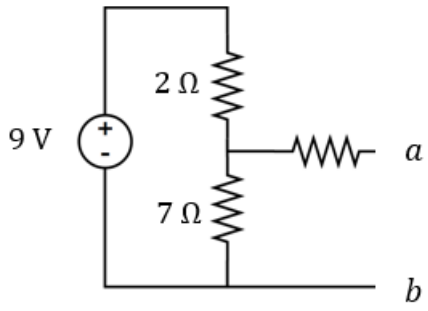


Fig. A

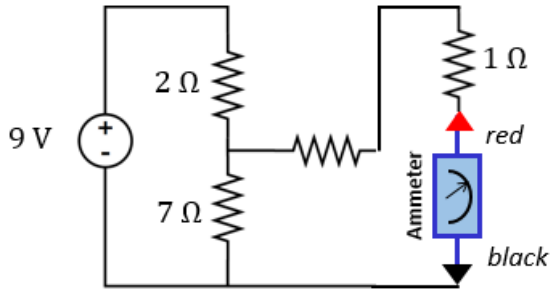
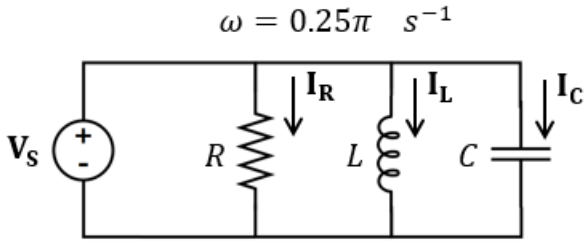
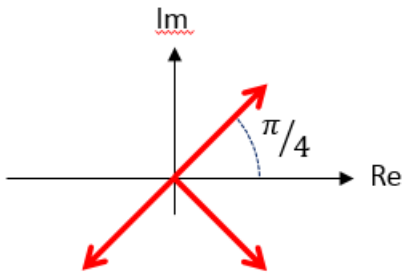


Fig. B

(3) (a) The phasor diagram shows the currents $\mathbf{I_R}$, $\mathbf{I_L}$ and $\mathbf{I_C}$. Each phasor has a length of 4 A. Find i_R and i_C at time t = 2 s. *(3 points)*

$i_R(2)$ $i_C(2)$



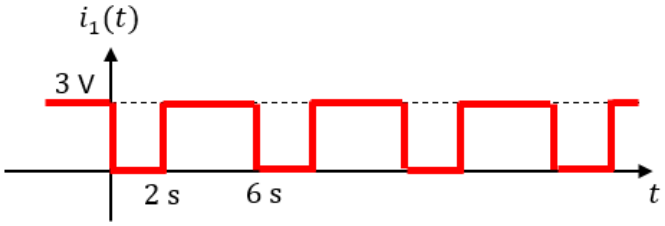


(b) Find I_{RMS} of $i_1(t)$. *(2 points)*

Find V_m (i.e., the magnitude of v_2) such that the average power received by the 2 Ω resistor in Fig. B is the same as the average power received by the 2 Ω resistor in Fig. A. *(2 points)*

I_{RMS} ☐

V_m ☐



(Note: this waveform is periodic)

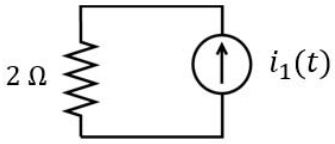
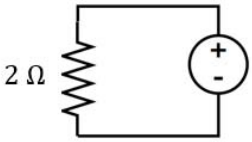


Fig. A

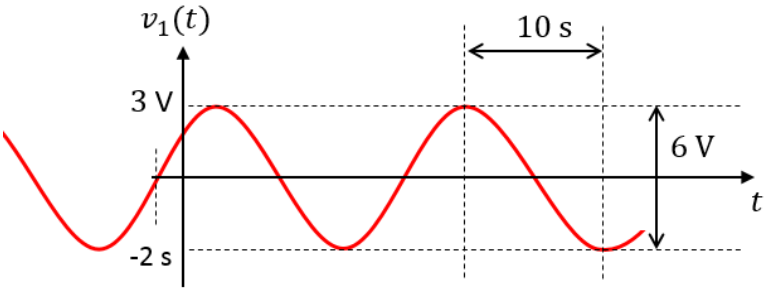


$v_2(t) = V_m \cdot \cos(500t + \frac{\pi}{12})$

Fig. B

(c) Find the equation of the time waveform $v_1(t)$. *(3 points)*

$v_1(t)$ ☐

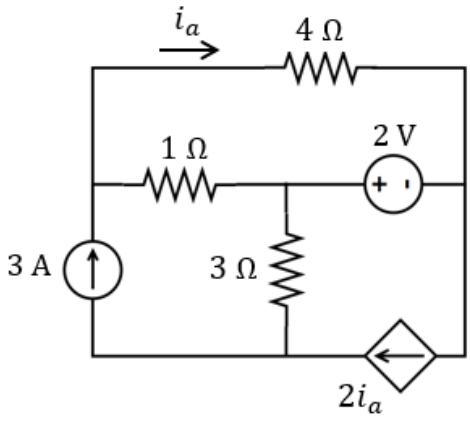


(4) (a) For the circuit below, find i_a. *(3 points)*

i_a

(b) What is the power *P* supplied by the dependent source? *(3 points)*

P



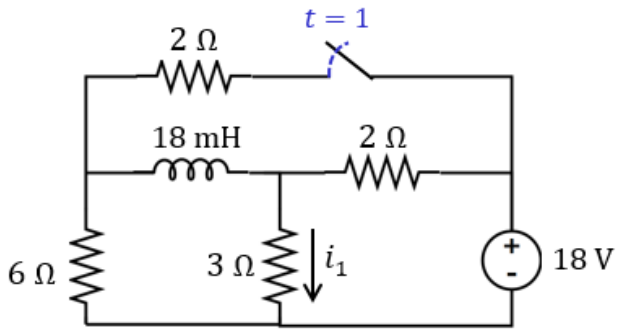
(5) For $t < 1$ s, the switch is closed and you may assume the system has reached steady state. The switch opens at time $t = 1$ s.

(a) Find $i_1(1^-)$. *(1 point)*

$i_1(1^-)$

(b) Find $i_1(t)$ for $t > 1$ s. *(6 points)*

$i_1(t)$

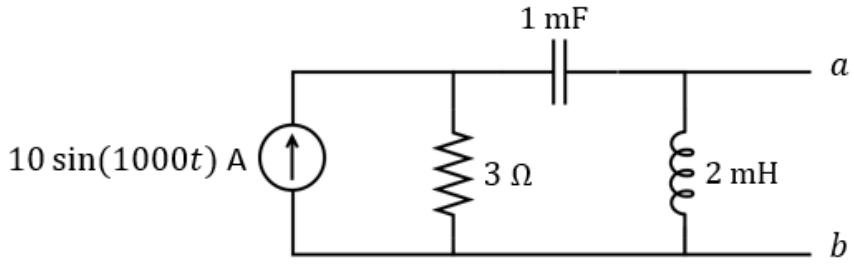


(6) (a) Find the complex power **S** received by the inductor. *(4 points)*

S ☐

(b) What load impedance $\mathbf{Z_L}$ should be attached between a and b to get maximum average power received by $\mathbf{Z_L}$? You can choose to give your answer in cartesian or polar form. *(4 points)*

$\mathbf{Z_L}$ ☐



(7) For $t < t_0$, the switch is in position *A* and you may assume the system is in steady state. The switch moves to position *B* at time $t = t_0 = \frac{\pi}{3000}$.

(a) Find the capacitor current i_C at time $t = t_0^-$ (i.e. with the switch in position A, just before it moves to position *B*). *(1 points)*

$i_C(t_0^-)$ ☐

(b) Find the inductor current i_L at time $t = t_0^+$ (i.e. immediately after the switch moves to position *B*). *(3 points)*

$i_L(t_0^+)$ ☐

(c) Find the capacitor current i_C at time $t = t_0^+$ (i.e. immediately after the switch moves to position *B*). *(4 points)*

$i_C(t_0^+)$ ☐