

Name: _____ (please print)

Signature: _____

ECE 2202 – Final Exam
December 9, 2020

Online

1. This exam is open book, open notes.
2. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
4. If the grader has difficulty following your work because it is messy or disorganized, you will lose credit.
5. Do not use red ink. Do not use red pencil.
6. You will have 140 minutes to work on the exam, and 15 minutes to download/print, scan and submit.
7. You **MUST** use LOWER-CASE letters for time domain variables, and UPPER-CASE LETTERS WITH AN OVERBAR for phasor domain variables. Significant credit will be subtracted if you do not follow this rule.

_____ /35

_____ /60

_____ /55

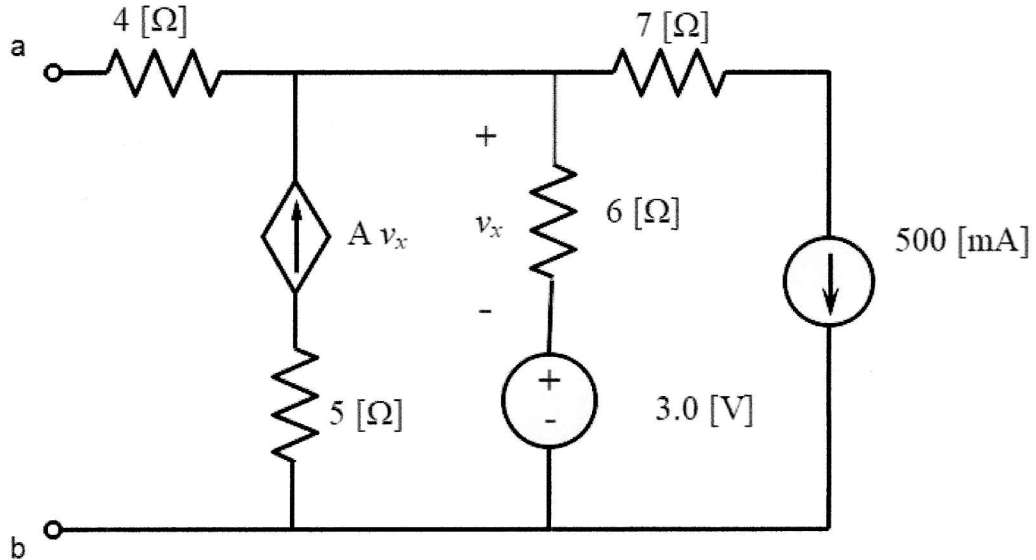
_____ /50

_____ /200

Room for extra work

1. [35 points] For the circuit below, do the following.

- Find the Thevenin equivalent of the circuit at terminals a, b, if the parameter $A = 0.5$.
- Find an expression for the Thevenin equivalent resistance as a function of the parameter A . That is, find R_{TH} in terms of A .
- Find the value of A that results in a Thevenin equivalent resistance of $-1 \text{ } [\Omega]$.



Room for extra work

Room for extra work

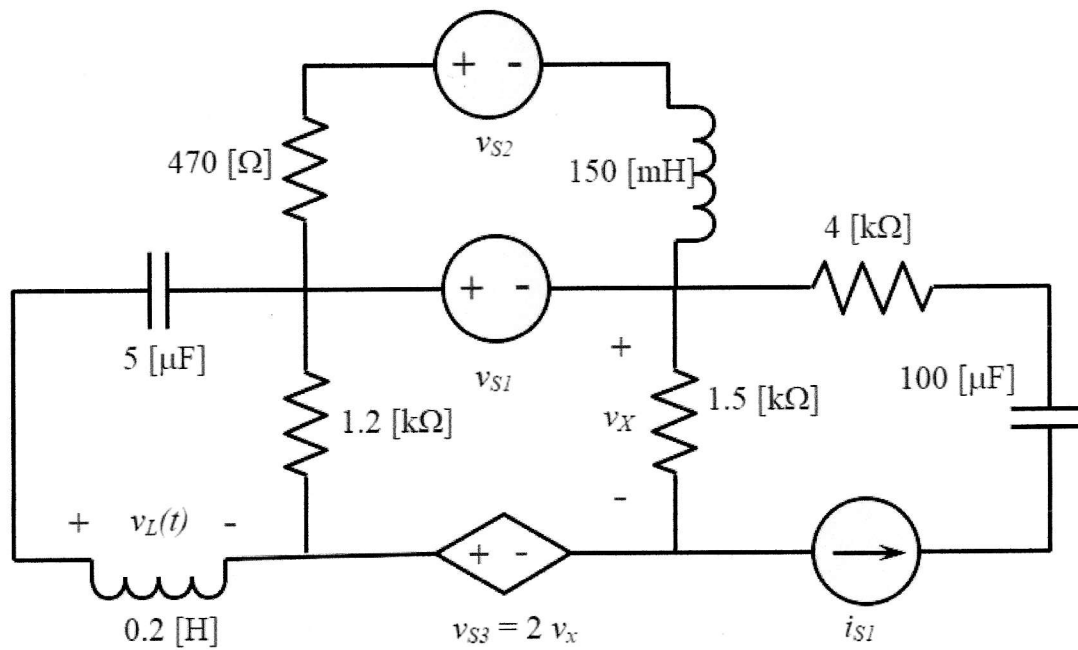
Room for Extra Work

3. [55 points] The circuit below is operating in steady state. Find the voltage $v_L(t)$. The values of the sources are given as follows.

$$v_{S1}(t) = 15 \text{ [V]} \cos(600t) - 37 \text{ [V]} \cos(1200t - 20^\circ)$$

$$v_{S2}(t) = 6.5 \text{ [V]} \sin(1200t)$$

$$i_{S1}(t) = 30 \text{ [mA]} \sin(600t)$$



Room for extra work

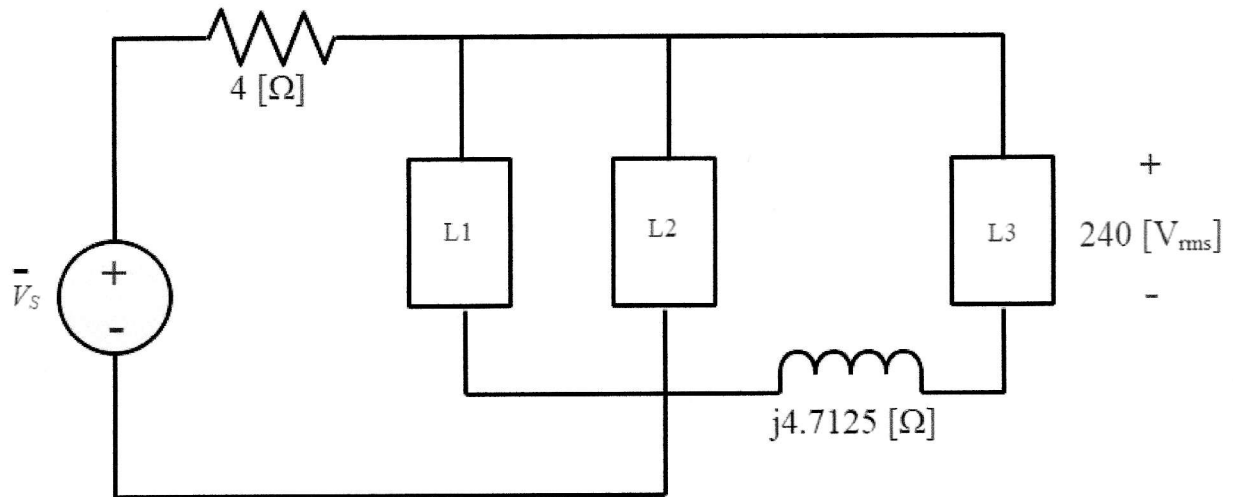
4. [50 points] The circuit below is operating in steady state and at a frequency of 30 [Hz]. The voltage across load 3 is known and is shown in the diagram. The loads are specified as follows.

Load 1 absorbs 2.5 [kVAR] at a power factor of 0.8 leading.

Load 2 is a 30 [Ω] resistor in parallel with a 120 [μ F] capacitor.

Load 3 absorbs 3.5 [kW] and 4.0 [kVAR].

- Find the source voltage \bar{V}_s necessary to produce the voltage indicated across L3.
- Find the complex power delivered by the source.



Room for extra work