

Name: _____ (please print)

Signature: _____

ECE 2202 – Quiz 6
November 3, 2022

1. This quiz is closed book, closed notes. You may have one 8.5 x 11" crib sheet.
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 30 minutes to work on this quiz.

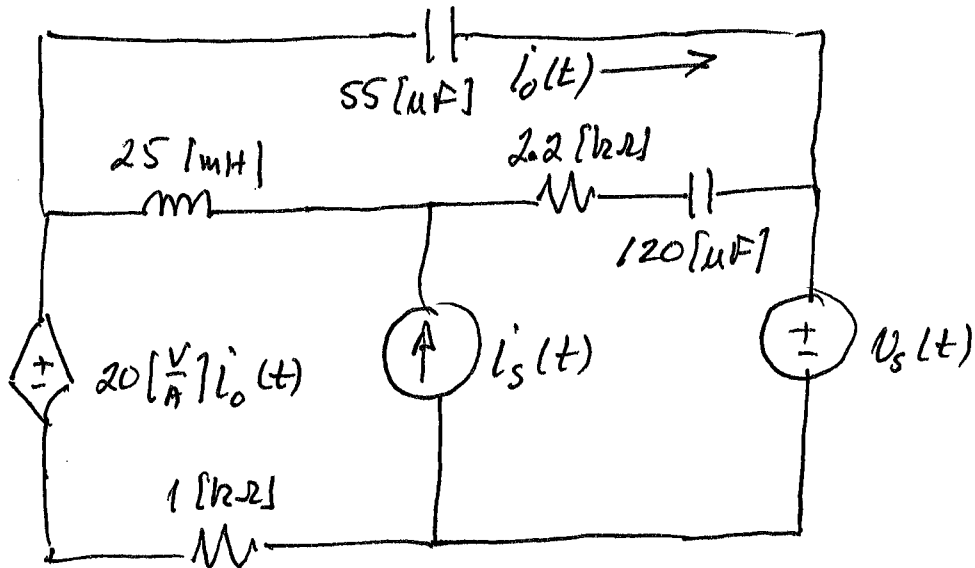
_____ /20

Room for extra work

The circuit below is operating in steady state.

- Draw the circuit in the phasor domain.
- Find $i_o(t)$.

Note that significant credit will be subtracted for “mixed domains”.



$$i_s'(t) = 20 \text{ [mA]} \cos(300t + 12^\circ)$$

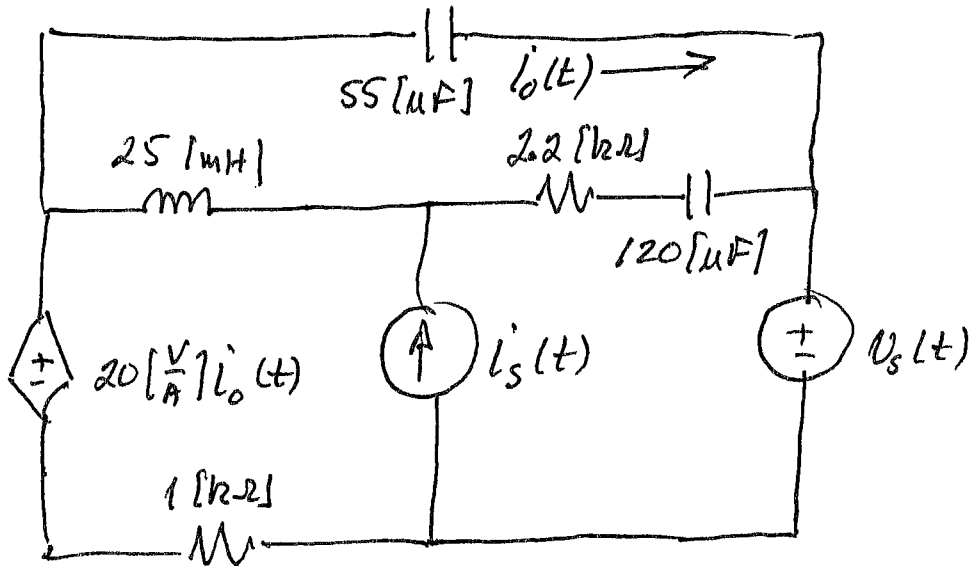
$$v_s(t) = 5.5 \text{ [V]} \sin(300t - 22^\circ)$$

Room for extra work

The circuit below is operating in steady state.

- Draw the circuit in the phasor domain.
- Find $i_o(t)$.

Note that significant credit will be subtracted for "mixed domains".



$$i_s(t) = 20 \text{ [mA]} \cos(300t + 12^\circ)$$

$$v_s(t) = 5.5 \text{ [V]} \sin(300t - 22^\circ) = 5.5 \text{ [V]} \cos(300t - 112^\circ)$$

Conversions:

$$55 \text{ [}\mu\text{F]} \rightarrow -j / (300 \cdot 55 \times 10^{-6}) = -j 60.61 \text{ [}\Omega\text{]}$$

$$25 \text{ [mH]} \rightarrow j (25 \times 10^{-3}) (300) = j 7.5 \text{ [}\Omega\text{]}$$

$$120 \text{ [}\mu\text{F]} \rightarrow -j / (300 \cdot 120 \times 10^{-6}) = -j 27.78 \text{ [}\Omega\text{]}$$

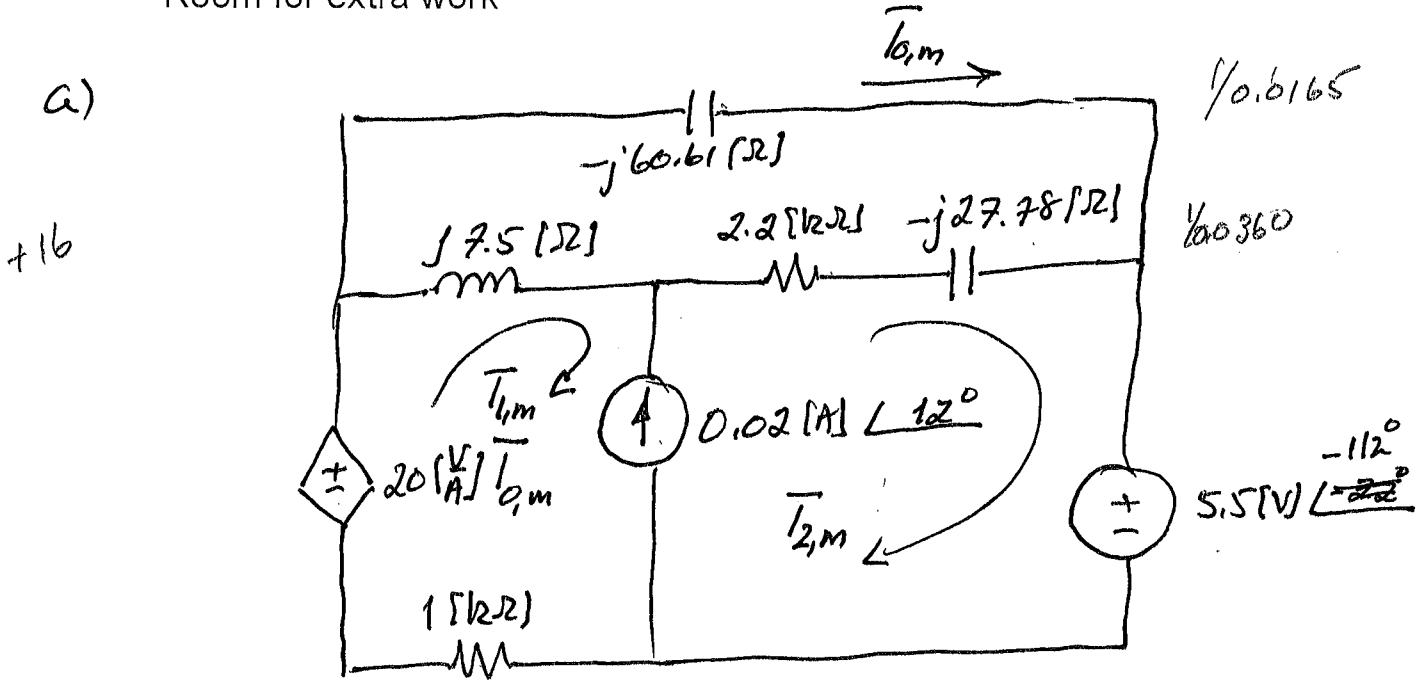
missing some overbars -6

$Z_c = -j\omega C$ -2 ea.

Mixed domains -8 3

notation -6

Room for extra work



b) we can use $I_{0,m}$ as a mesh current:

+10

$$\begin{cases} \circ (I_{1,m} - I_{0,m}) \cdot j7.5 + (I_{2,m} - I_{0,m})(2200 - j27.78) + 5.5 \angle -112^\circ + 1000 I_{1,m} - 20 I_{0,m} = 0 \\ \circ I_{2,m} - I_{1,m} = 0.02 \angle 12^\circ \\ \circ -j60.61 I_{0,m} + (2200 - j27.78)(I_{0,m} - I_{2,m}) + j7.5(I_{0,m} - I_{1,m}) = 0 \end{cases}$$

+4

$$\begin{aligned} \bar{I}_{1,m} &= \frac{-5.27 + j7.223 \text{ [mA]}}{1.798 + j6.601 \text{ [mA]}} = 6.841 \angle 74.76^\circ \text{ [mA]} \\ \bar{I}_{2,m} &= \frac{21.36 + j10.76 \text{ [mA]}}{14.29 + j7.223 \text{ [mA]}} = 23.92 \angle 26.74^\circ \text{ [mA]} \\ \bar{I}_{0,m} &= \frac{21.06 + j11.27 \text{ [mA]}}{14.09 + j7.54 \text{ [mA]}} \\ &= 23.89 \angle 28.15^\circ \text{ [mA]} \\ &= 15.98 \angle 28.15^\circ \text{ [mA]} \end{aligned}$$

+6

$$i(t) = 15.98 \cos(300t + 28.15^\circ) \text{ [mA]}$$