

Name: \_\_\_\_\_ (please print)

Signature: \_\_\_\_\_

ECE 3355  
Quiz 1 (on-line)  
February 3, 2021

Quiz duration: 30 minutes

1. This quiz is open book, open notes. You may not, however, consult another person, verbally or online, for help. You may not submit your quiz to any site online in an effort to get help on the quiz.
2. Show all work necessary to complete the problem on these pages. A solution without the work shown will receive no credit.
3. Show units in intermediate and final results, and in figures.
4. If your work is sloppy or difficult to follow, points will be subtracted.

**Instructions for an on-line quiz**

- You will have 30 minutes to take the quiz, and 15 minutes to scan and upload it. Blackboard will stop accepting your work at 11:20 am.
- Please turn on your video, but do not focus it on the work you are doing.
- When you upload, make it a single .pdf document, and be sure it is legible and complete before uploading!
- I will be available for questions. If you need to ask a question, please use the “raise your hand” option on Zoom.

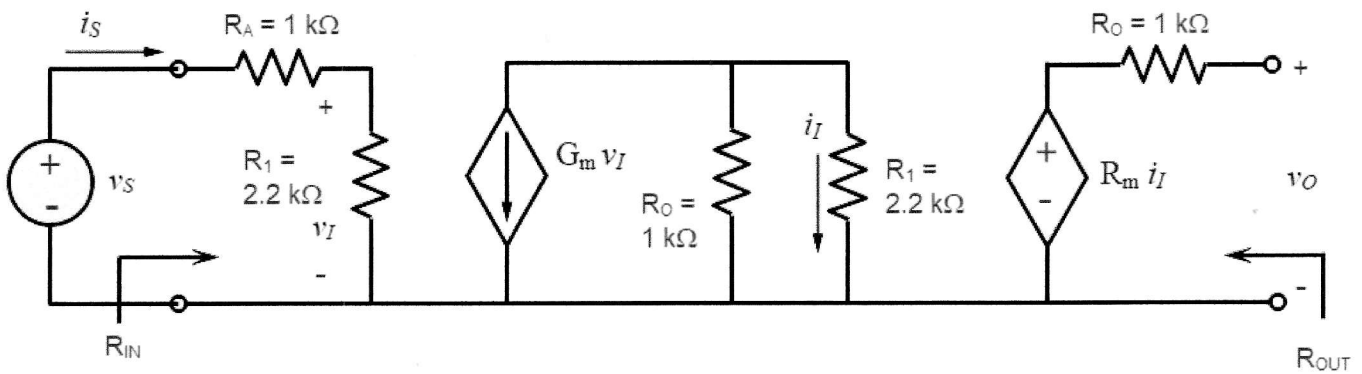
\_\_\_\_\_/25

Room for Extra Work

The circuit below represents a cascaded amplifier with a source voltage  $v_S$  and input current  $i_S$ , and open-circuit output voltage  $v_O$ . It is given that  $G_m = 25 \text{ mA/V}$ , and  $R_m = 10 \text{ V/A}$ .

a) Find the parameters of a single voltage amplifier that has the same input resistance  $R_{IN}$ , output resistance  $R_{OUT}$ , and gain  $v_O/v_S$  as the amplifier shown. Draw the voltage amplifier, clearly showing relevant parameters.

b) Find the parameters of a transresistance amplifier that has the same input resistance  $R_{IN}$ , output resistance  $R_{OUT}$ , and gain  $v_O/i_S$  as the amplifier shown. Draw the transresistance amplifier, clearly showing relevant parameters.

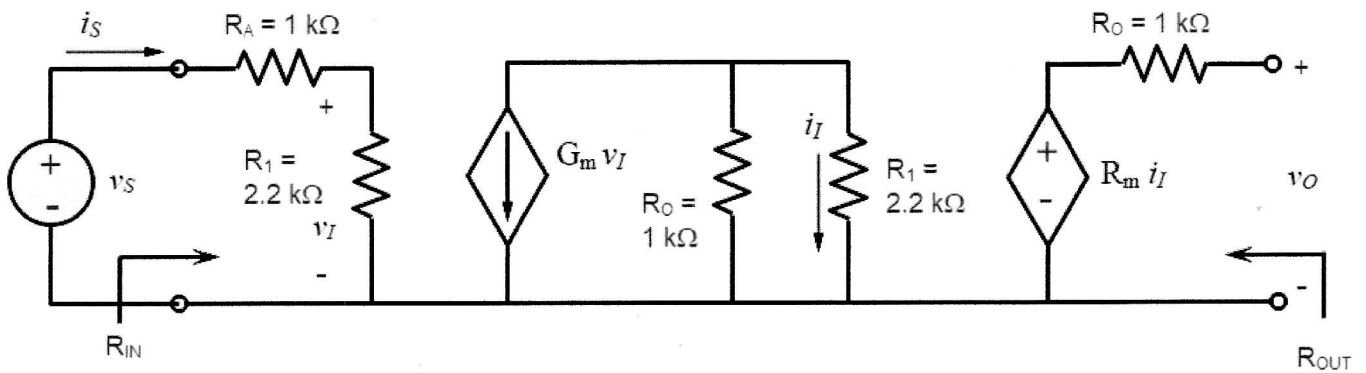


Room for Extra Work

The circuit below represents a cascaded amplifier with a source voltage  $v_S$  and input current  $i_S$ , and open-circuit output voltage  $v_O$ . It is given that  $G_m = 25 \text{ mA/V}$ , and  $R_m = 10 \text{ V/A}$ .

a) Find the parameters of a single voltage amplifier that has the same input resistance  $R_{IN}$ , output resistance  $R_{OUT}$ , and gain  $v_O/v_S$  as the amplifier shown. Draw the voltage amplifier, clearly showing relevant parameters.

b) Find the parameters of a transresistance amplifier that has the same input resistance  $R_{IN}$ , output resistance  $R_{OUT}$ , and gain  $v_O/i_S$  as the amplifier shown. Draw the transresistance amplifier, clearly showing relevant parameters.



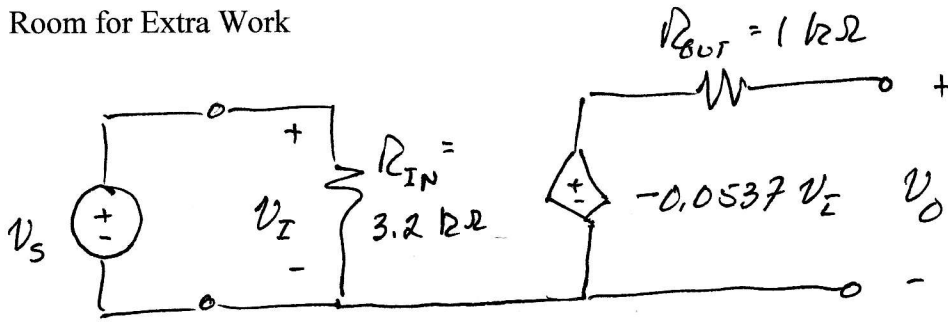
a)  $R_{IN} = R_A + R_1 = 3.2 \text{ [k}\Omega\text{]}$       These values hold for  
 $R_{OUT} = R_o = 1 \text{ [k}\Omega\text{]}$       b) as well.

$$v_O = R_m i_I \quad i_I = -G_m v_I \frac{R_o}{R_o + R_1} \quad v_I = v_S \frac{R_1}{R_1 + R_A}$$

$$\Rightarrow \frac{v_O}{v_S} = -G_m R_m \frac{R_o}{R_o + R_1} \cdot \frac{R_1}{R_1 + R_A}$$

$$\boxed{\frac{v_O}{v_S} = -0.0537 \frac{V}{V}}$$

Room for Extra Work



b)  $v_o = R_m i_I$      $i_I = -G_m v_I \frac{R_o}{R_o + R_i}$      $v_I = i_s R_i$

$\Rightarrow \frac{v_o}{i_s} = -G_m R_m R_i \frac{R_o}{R_o + R_i}$      $\frac{v_o}{i_s} = -171.9 \frac{V}{A}$

