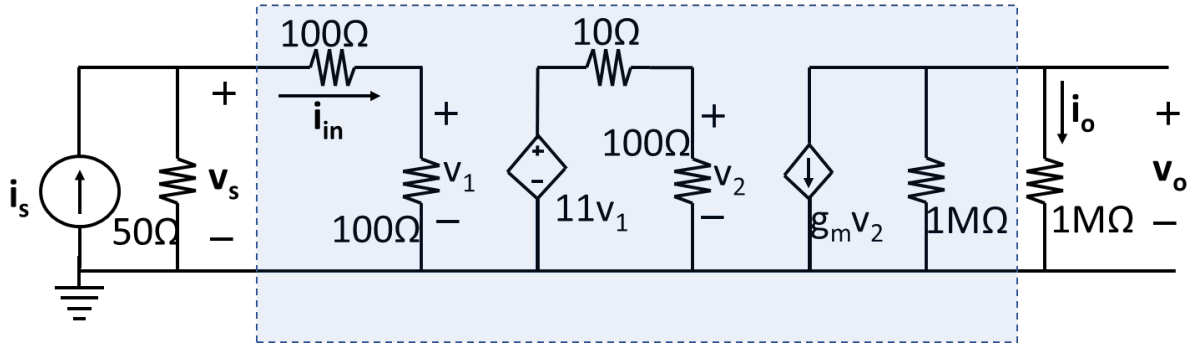
Spring 2024 – ECE 3020

Homework 2

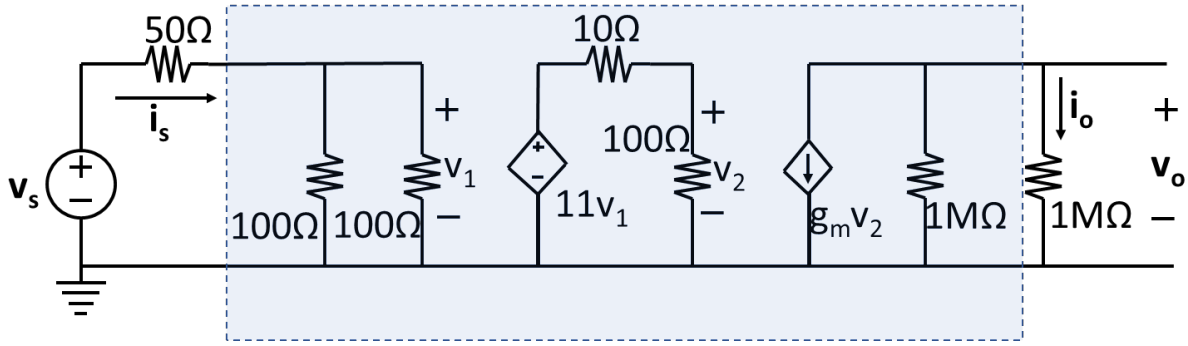
Due: 01/24/2024

1. For the amplifiers shown below, assume gm = 4mA/V. Calculate
   a) The input resistance, Rin
   b) Thevenin equivalent source voltage
   c) Overall voltage gain (v_o/v_s)
   d) Overall current gain (i_o/i_s)

   I.



   II.



2. (P1.46) A buffer amplifier with a gain of 1V/V has an input resistance of 1MΩ and an output resistance of 20Ω. It is connected between a 1-V, 200kΩ source and a 100Ω load. What load voltage results? What are the corresponding voltage current and power gains (in dB)?
3. (P1.47) Consider the cascade amplifier in Exercise #12 (Example 1.3 from the Book). Find the overall v_L/v_s obtained when the 1st and 2nd stages are interchanged. Compare this value with the result in Exercise #12 and comment.

4. (P1.52) A voltage amplifier with an input resistance of 20kΩ, an output resistance of 100Ω, and a gain of 1000V/V is connected between a 100-kΩ source with an open-circuit voltage of 10mV and a 100-Ω load. For this situation:
    a. What output voltage results?
    b. What is the voltage gain from source to load?
    c. What is the voltage gain from the amplifier input to the load?
    d. If the output voltage across the load is twice that needed and there are signs of internal amplifier overload, suggest the location and value of a single resistor that would produce the desired output. Choose an arrangement that would cause minimum disruption to an operating circuit. (*Hint*: Use parallel rather than series connections.)