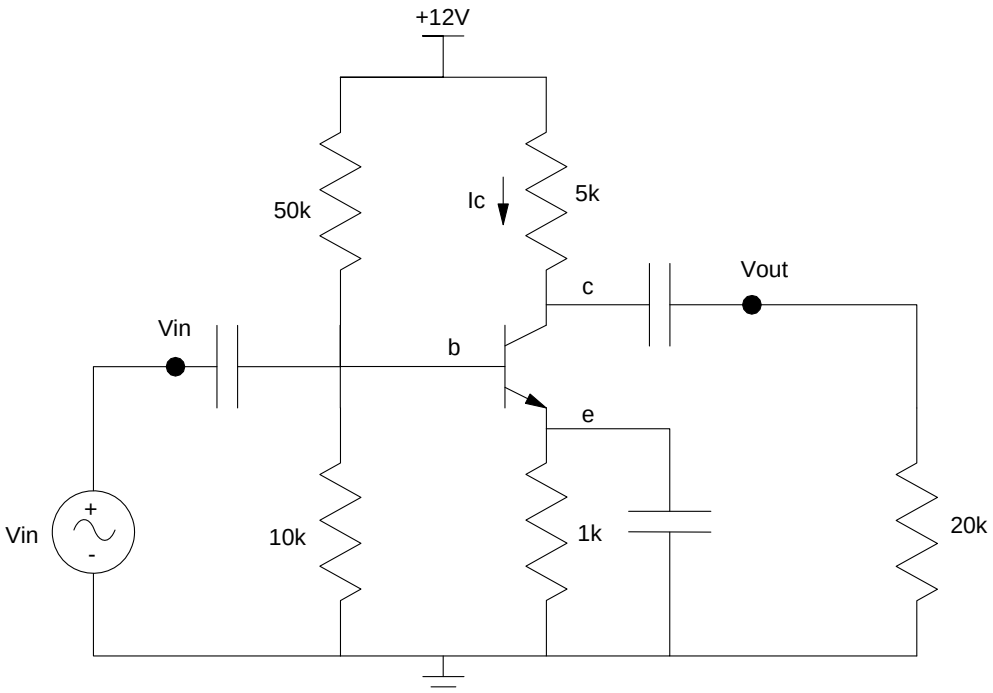
ECE 321 - Homework #4

BJT Amplifier Design. Due Monday, April 25th

For each problem, use the following circuit. Assume an ideal silicon diode with $\beta = 100$



Problem 1-3: BJT Amplifier in Common Base or Common Collector Configuration

1a) Draw the small-signal model for this circuit in common base configuration.

1b) Determine the 2-port model for this circuit in common base configuration.

2a) Draw the small-signal model for this circuit in common collector configuration.

2b) Determine the 2-port model for this circuit in common collector configuration.

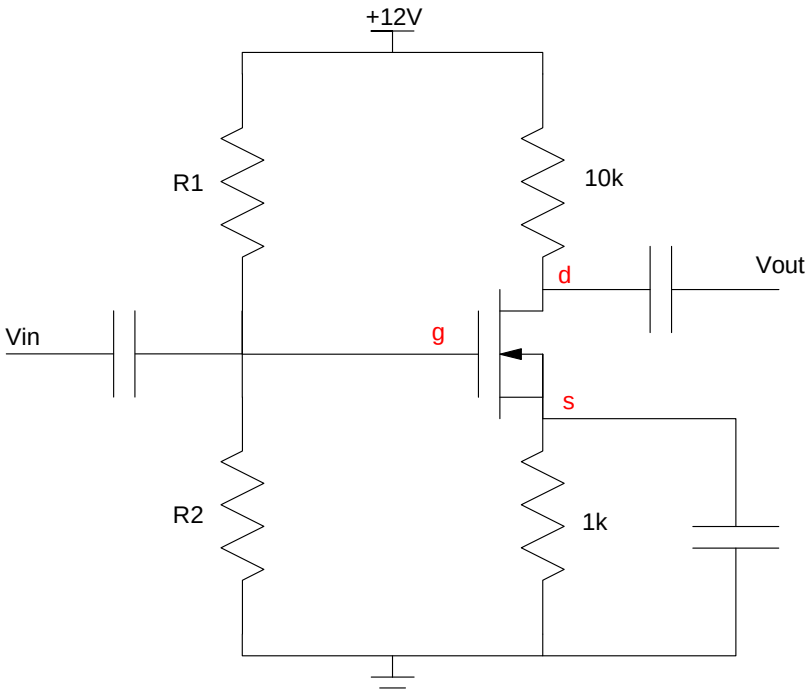
3) Determine the 2-port model for a common emitter : common collector amplifier.

MOSFET Amplifier: Assume for the MOSFET amplifier (next page) that

- $V_{tn} = 2V$
- $k_n = 0.001 \frac{A}{V^2}$

4) Determine R1 and R2 so that the Q point is Vds = 6V and R1 || R2 = 100k Ohms

5) Determine the 2-port model for this MOSFET amplfiier in common source configuration.



Problem 4-5: Common Source Amplfiier

6) Use CE / CC / CB / CD amplifiers to design a multi-stage amplifier to meet the followin requiremeints:

Input:

- 1uVpp sine wave at 1kHz, output impedance = 100k Ohms

Output:

- 8 Ohm Speaker

Relationship:

- 1uVpp sine wave at the input drives the 8 Ohm speaker at 4 Watts at 1kHz, +- 1 Watt

Problem 7-10) Term Project

Design, build, and test one section of your term project. Include

7) Requirements. What are the inputs, output, and how they relate.

8) Analysis: Give computations for resistors, etc. so that your circuit meets your requirements.

9) Test: Simulate in PartSim (or like program) to verify your analysis

10) Validation: Build your circuit in lab and collect data to verify it meets your requirements.