Integrated Circuits Lab
Department of Electrical Engineering
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Qualifying exam
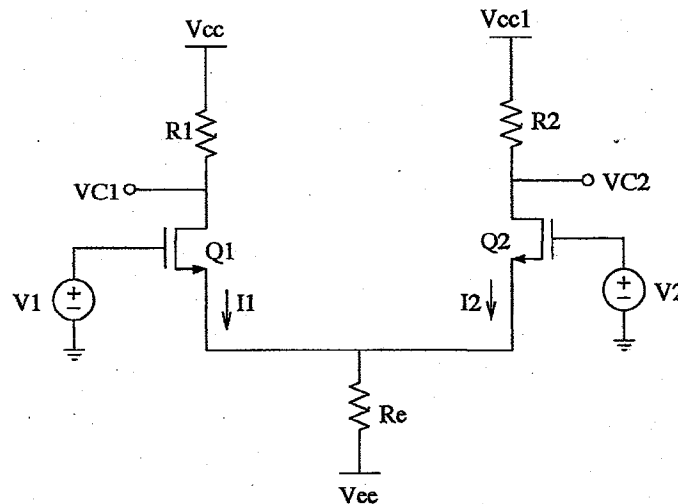January 2007
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Problem 1

You are stranded on a melting glacier with (1) a hand-full of batteries, (2) a hand-full of resistors, (3) an n-channel MOSFET and (4) a length of wire. You need to somehow build an amplifier to try to send for help.

(a) With just these parts, can you build an amplifier? Please "chisel circuit in the ice" & explain its operation.

(b) What is your goal with the battery(batteries)?

(c) What is your goal with the resistor(s)?

(d) You now find another MOSFET in your coat pocket, and its a p-FET. Should you modify your circuit? Why?

(e) You suspect that your amplifier's high-frequency cuttoff is too low to be useful. What should you look for (and change if you could) in the circuit and MOSFETs?

Problem 2

Consider this symmetric differential amplifier. Please explain how the following change when a common-mode voltage is ramped up ($V_{ee} \rightarrow V_{cc}$) at the inputs:

(a) The FETs' mode of operation

(b) The FETs' source voltage