Integrated Circuits Lab
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Qualifying exam
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Problem 1

Consider an n-channel MOSFET with: μ_n, C_{ox}, W, L, V_t, V_{GS} and V_{DS}.

(a) What is this transistor's transconductance if operating in triode (linear) mode?

(b) If this transistor is operating in saturation mode rather than in triode (linear) mode, is the |gain| of an amplifier larger or smaller? Please show why.

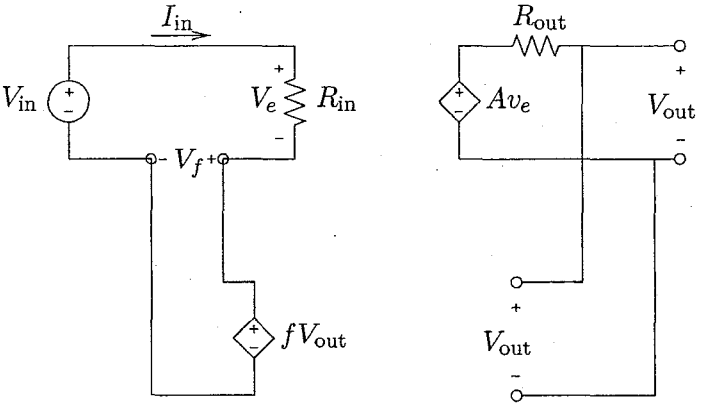
Problem 2

Consider an amplifier with three capacitors C_1, C_2 & C_3. Each capacitor "sees" a resistance, found with the other capacitors removed. These resistances are R_1, R_2 & R_3.

(a) You need to increase the high frequency cutoff of the amplifier and can adjust only one capacitor. Which capacitor should you adjust? Why, and how?

(b) Is this amplifier's dominant pole given by 1/(RC), where R is R_1, R_2 or R_3 and C is C_1, C_2 or C_3?

Problem 3



(a) What is the gain ($G = \frac{V_{out}}{V_{in}}$) of this circuit?

(b) The input resistance of this circuit is $R_{in,f\neq 0}$. If f is reduced to zero ($f = 0$), the input resistance is $R_{in,f=0}$. How is $R_{in,f\neq 0}$ related to $R_{in,f=0}$?