

ECE2100
Exam 2

This is an open book, and notes exam. You may use a calculator.

NAME: _____

I certify that the work below is my own.

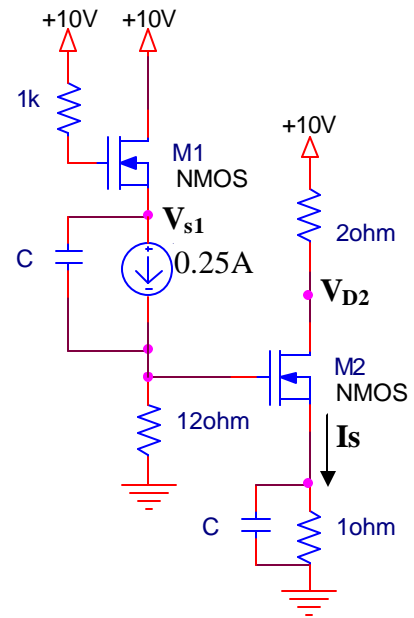
Signature: _____

Problem 1

Use: $V_t=1V$
 $k_n'(W/L)=2A/V^2$
 $\lambda=0$ for all transistors
The 0.25A current source is not ideal and may have a voltage drop across it.
All caps are large.

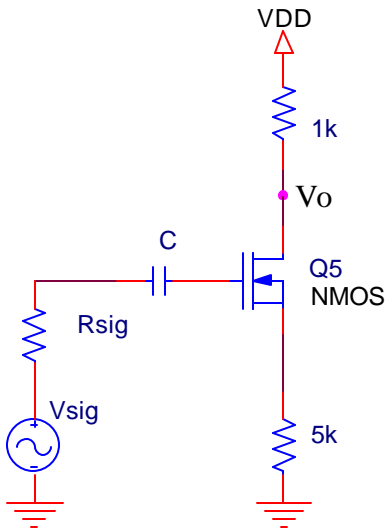
Solve the circuit for the **DC** values of:

- (a) V_{D2}
- (b) V_{s1}
- (c) I_s



Problem 2:

$v_{sig} = 0.01\sin(\omega t)$. Does this circuit operate as an AC amplifier? If so, what is the gain, $\frac{V_o}{V_{sig}}$, of the following circuit in terms of VDD?

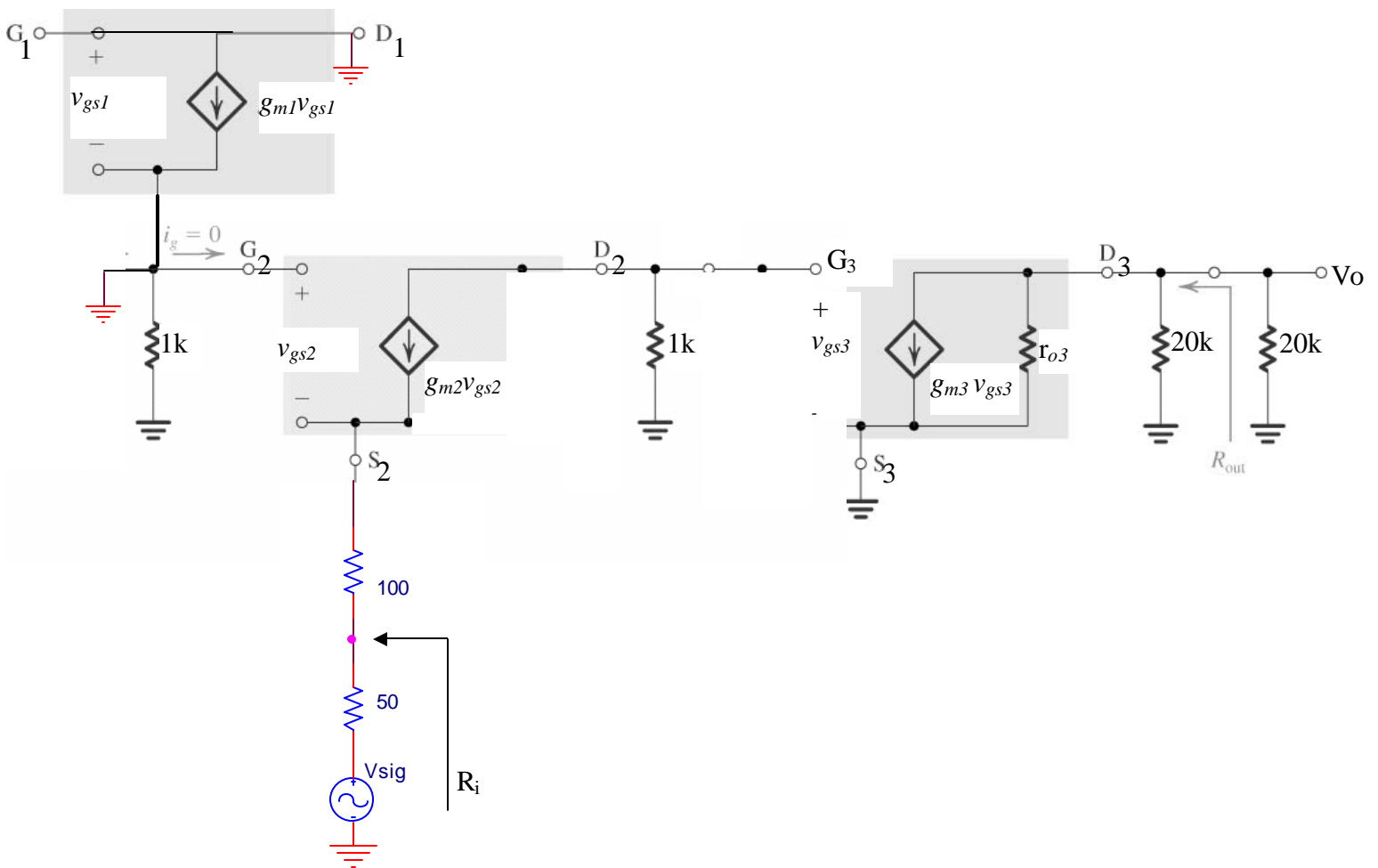


Problem 3

Use: $V_t=1V$
 $k_n'(W/L)=1mA/V^2$
 v_{sig} is an AC source
 Transistor 1 has DC values: $V_{GS}=5V, I_D=8mA$
 Transistor 2 has DC values: $V_{GS}=5V, I_D=8mA$
 Transistor 3 has DC values: $V_{GS}=3V, I_D=2mA$

For the following hybrid- π equivalent circuit, find the following values:

- (a) R_i (input resistance – ignore the 50ohm and V_{sig}) (b) R_{out} (output resistance) (c) gain, $\frac{V_o}{V_{sig}}$



Problem 4

For the circuit shown below, draw the AC small-signal equivalent circuit (use hybrid- π or model T). Make sure that everything is labeled in terms of the transistor number. (e.g. g_{m1} , v_{gs2} , etc.). $I \neq 0$ for all transistors. v_{sig} is an AC source.

