1e material we have covered so far this semester is summarized (but NOT limited to) below:

Understand the basic operation of a MosFet:

- 3 regions of operation: cutoff, triode, saturation and know all current equations associated with each region and what their cross sections look like
- the $I_D$ versus $V_{DS}$ graph

Understand the bias point concept for linear amplification.

Be able to separate the DC and AC analysis for a circuit containing a MosFet.

Be able to analyze a circuit (with or without cap in it) containing a MosFet for DC operation.

Be able to draw a small-signal model of a MosFet circuit.

Be able to analyze a small-signal circuit to find overall gain, midband gain, input resistance, and output resistance.

Determine $\omega_L$ and $\omega_H$ or $f_L$ and $f_H$.

\[
V_i = 1V, \quad k_n'(W/L) = 2A/V^2, \quad \lambda = 0
\]

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) $I_s$

\[
V_i = 1V, k_n'(W/L) = 1mA/V^2, \quad v_{sig} \text{ is an AC source}
\]

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: $V_{GS} = 3V, I_D = 2mA$
$\lambda = 0$ (for all transistors)

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

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Find (a) $R_i$ (input resistance – ignore the 50ohm and $V_{sig}$)
(b) $R_{out}$ (output resistance)
(c) midband gain, $\frac{V_o}{V_{sig}}$
Draw the small-signal equivalent circuit.

- $V_i = 1\,V$, $k_n' (W/L) = 1\,mA/V^2$, and $\lambda = 0$.
- Draw the small-signal equivalent circuit.
- Analyze the circuit to find $A_v = V_o/V_{in}$, $R_{in}$ and $R_{out}$.
- Find all low frequency pole values.
- Find $\omega_H$ given $C_{gs} = 10\,pF$ and $C_{gd} = 0.1\,pF$.