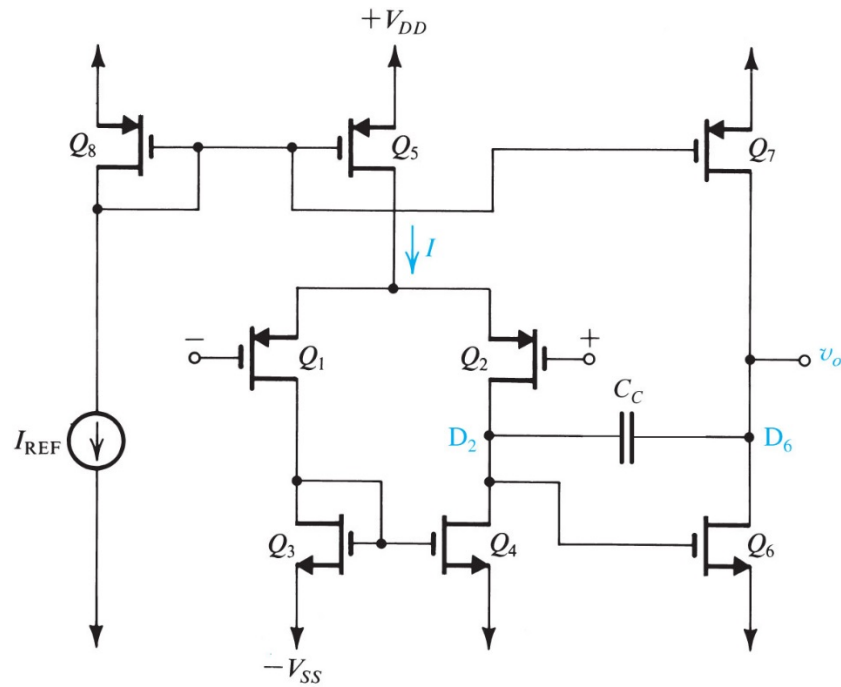


Homework 7 – Due 11/9/2016

Problems (not review questions): 9.113, 9.114



**Figure 9.40** Two-stage CMOS op-amp configuration.

Answers for **9.113**:  $W = 20 \mu\text{m}$ ,  $A_1 = -36 \text{ V/V}$ ,  $A_2 = -36 \text{ V/V}$ ,  $-1.25 \text{ V} \leq V_{\text{ICM}} \leq +0.25 \text{ V}$ ,  $-1.25 \text{ V} \leq v_o \leq +1.25 \text{ V}$

The results are summarized in the following table.

	$Q_1$	$Q_2$	$Q_3$	$Q_4$	$Q_5$	$Q_6$	$Q_7$	$Q_8$
$I_D$ ( $\mu\text{A}$ )	112.5	112.5	112.5	112.5	225	225	225	225
$ V_{OV} $ (V)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
$ V_{GS} $ (V)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
$g_m$ (mA/V)	0.9	0.9	0.9	0.9	1.8	1.8	1.8	1.8
$r_o$ (k $\Omega$ )	80	80	80	80	40	40	40	40

#### EE381 HOMEWORK FORMAT GUIDELINES

Things to remember

- 1) Re-Draw the Circuit on your homework sheet.
- 2) Show all work.
- 3) Final answer should be in decimal form.
- 4) Final answers should be boxed.
- 5) Your name should be on every page.