CONTINUUM ’25

PS - 1

The Two Stage Op-Amp Design

You are required to design a two-stage Miller-compensated op-amp with a capacitive load.
A typical two-stage op-amp looks like:

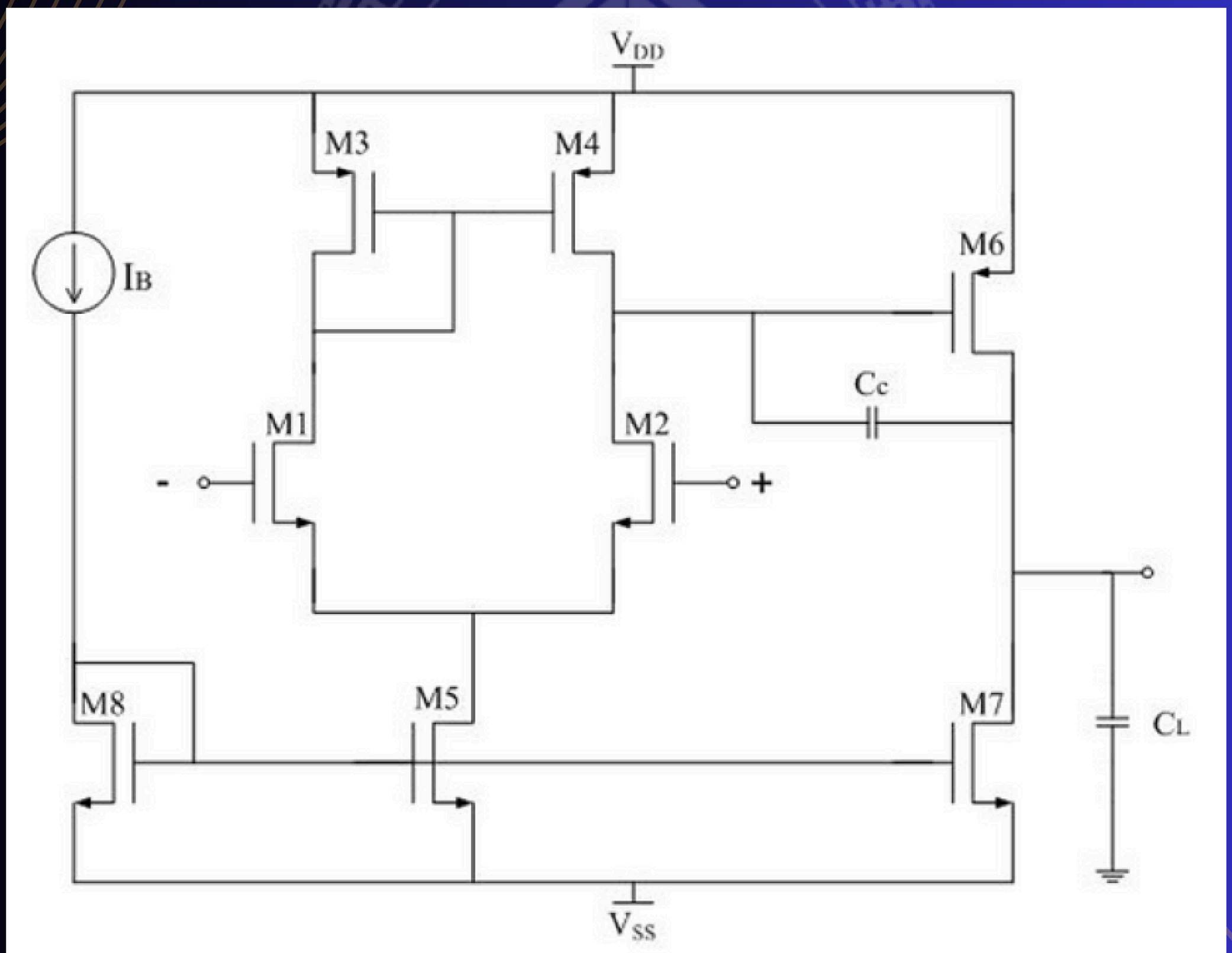

Figure 1: NMOS Two Stage op amp

Design Specifications

Your op-amp model will be evaluated based on how closely it meets the following specifications:

- Reasonable lengths and widths of NMOS transistors must be used. Report the W and L of each transistor. [5 points]
- DC gain = 90dB [5 points]
- Input Common Mode Range 0.7 V to 1.6 V [5 points]
- Phase margin > 60 degrees for a capacitive load of 5 pF [5 points]
- Gain-bandwidth (GBW) product of 30 MHz [5 points]

Given:

For NMoS, Vth = 0.7V, $\lambda = 0.04\ V^{-1}$, $\mu_n C_{ox} = 100\ \mu A/V^2$

For PMoS, Vth = -0.7V, $\lambda = 0.05\ V^{-1}$, $\mu_p C_{ox} = 50\ \mu A/V^2$