Department of Electrical Engineering
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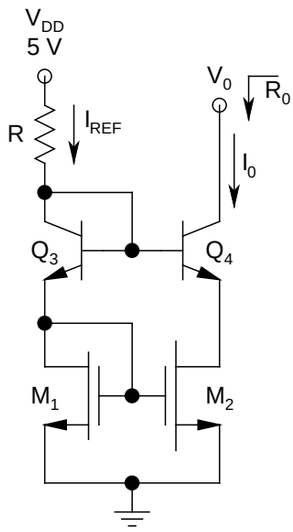
EE 210 **MID-SEM P3** **24.2.21**

In the BiMOS (combination of BJT and MOS) cascode current source shown in the figure, M_1-M_2 is a *perfectly matched pair*, and so is Q_3-Q_4. Neglect DC base current, and assume that $\lambda V_{DS} \ll 1$.
Data: for M_1-M_2: $V_{TN0} = 0.7$ V, $k'_N = 40\ \mu A/V^2$, $\gamma = 0.4\ V^{1/2}$, $2\phi_F = 0.6$ V; for Q_3-Q_4: $\beta = 100$, $V_A = 100$ V.



a) Show that $R_0 \approx \beta r_{04}$. Clearly highlight all the assumptions made in arriving at this result. **5**

b) Choose the values of I_{REF}, R, and (W/L) of M_1-M_2, in order to have R_0 and $V_{0,min}$ of 1 GΩ and 1 V respectively. **7**

c) What is the most critical parameter and what should be its value for the assumption made in the derivation of R_0 [part a)] to hold? An error band of 5% is acceptable. **3**