Lecture 2: Device Models I (Bipolar Review)

- Announcements:
- The course website was up and running last week
  - Just google ee140 to get to it
- Discussion sections
  - M 4-5 p.m. in 241 Cory
  - F 4-5 p.m. at a location TBD (this one starts this week)
- HW#1 should be online later today … due next Wednesday, at 8 a.m., in the 140/240A box on 1st floor (near the TI lab)
- TA office hours held in ~~367~~ Soda Hall ~~Cory for now~~
  - Waiting to hear if the room needs to be changed
  - Actually, looks like it will be 288 Cory
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- Lecture Topics:
  - Review (fast)
  - Bipolar Junction Transistor Modeling
    - —Basic Structure & Physics
    - —Large Signal Models
    - —DC Operating Point
    - —Small Signal Models
    - —Frequency Shaping Elements
    - —Layout
    - —Unity Gain Frequency
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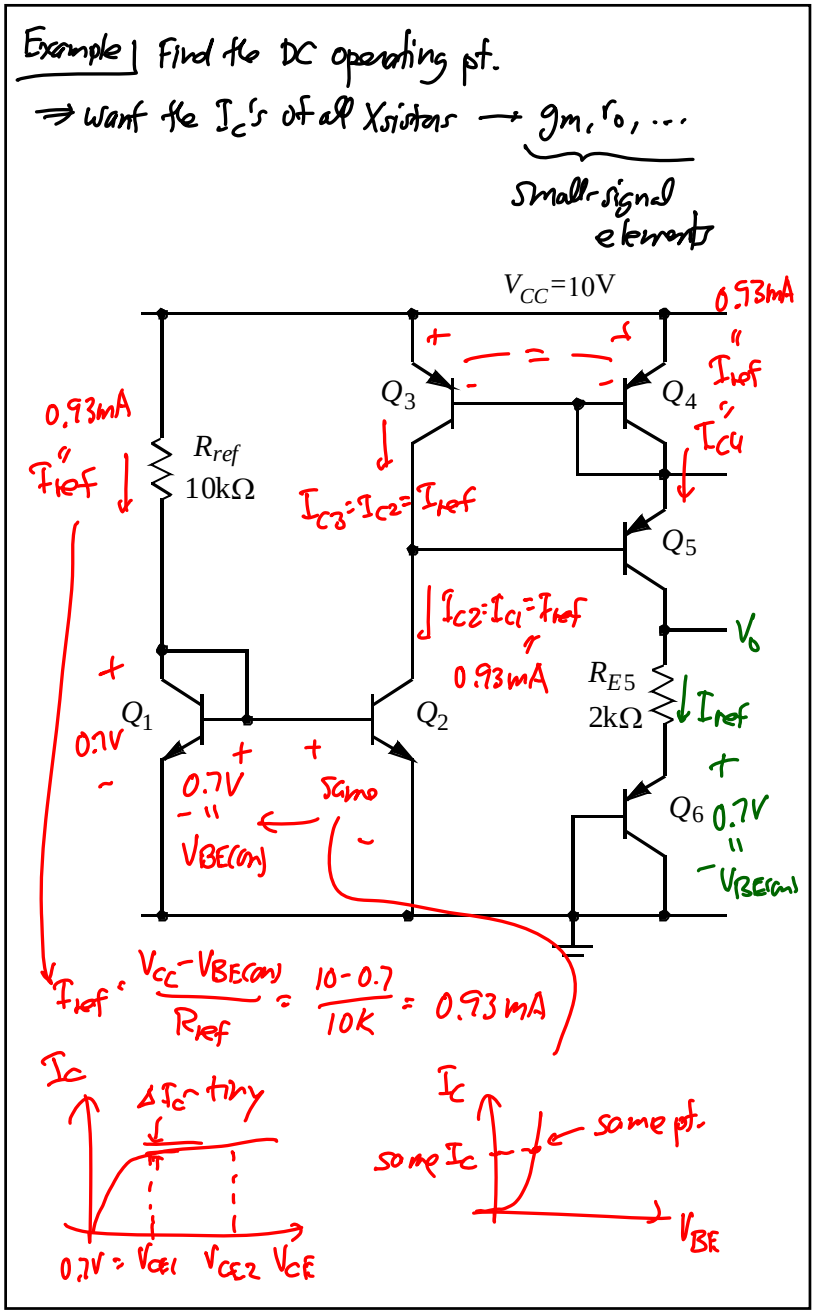
- Last Time: Reviewed op amps and started into BJT modeling using the module handout
- Continue with the handout



$V_O = V_{BE6(on)} + I_{REF}R_{E5} = 0.7 + (0.93m)(2K) = 2.56V$

For Q_5 to be FA, need:

$V_O < V_{CC} - V_{BE4(on)} - V_{CE5(sat)}$

$10 - 0.7 - 0.2 = 9.1V$ → Q_5 is FA!

What if $R_{E5} = 20k\Omega$:

$V_O = 0.7V + (0.93m)(20K) = 19.3V$ → Q_5 is saturated!

$V_O = V_{CC} - V_{BE4(on)} - V_{CE5(sat)} = 9.1V$

$I_{E5} = \frac{V_O - V_{BE6(on)}}{R_{E5}} = \frac{9.1 - 0.7}{20K} = 0.42mA$