E151 Lecture 26 – Review

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ENGR151

Disclaimer

These are notes for Prof. Spencer to give the lecture, they were not intended as a reference for students. Students asked for them anyway, so I’m putting them up as a courtesy. Remember that they are not intended as a substitute for attending lecture.
Topics Since the Midterm

- Dynamics
  - Caps in BJT model
  - Exact CE Xfer function
  - Miller effect & approximation
  - OCTC & Cascodes
  - Step Responses
- Differential Analysis
  - CM and DM signals
  - CM and DM ½ Circuits
  - CMRR and PSRR
  - Offsets
- References
  - Sensitivity analysis
  - Examples
- Output Stages
  - Large signal analysis
  - Examples
- Op-amp design
  - Basics: 3 stages, etc.
  - Design specs: I_B, V_ICM, ...
  - Compensation & Xfer fn.
- Stability & Feedback Effects

Topics before the Midterm (Digging Deep)

- Thevenin review and basics of dynamics
- Amplifier model and input/output impedance
- Diode and BJT equations, survey of physics, small signal models
- Going from small signal models to amplifier models
- Examples of single-stage amplifiers: CE, CB, EF, Cascode
- Multistage analysis, Current Mirrors, Active Loads

- All of this together lets us understand real op-amps!
Compensation cap and weird looking diode.

Input and output short circuit protection.
Analyze Mirror Loaded Emitter Coupled Pair

- $r_{in, dm}$ unaffected by load, whew. Both sides help $av, dm$.
- $r_o$ is a fundamentally single ended quantity ... involved. Anecdote.

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\begin{align*}
    \text{Recall: } & \frac{r_{o3} \parallel r_{o4}}{2}, \text{ not just } r_{o3} \parallel r_{o4} \\
    \text{rin, dm} &= 2r_{pi} \\
    av, dm/2 &= i_{out}\times r_{out} \text{ for each vdm/2 ... so} \\
    av, dm &= (g_{m3} + g_{m4})(r_{o3} \parallel r_{o4})/2
\end{align*}
\]