Inspection Analysis on a Multitransistor Ckt.

\[ R_d = R_{T1} + \frac{1}{g_m} \quad r_{m} + r_{T2} = 2 r_{T1} \]

\[ R_o = r_{o2} \left( 1 + \frac{g_m}{g_{m1}} \right) \left\| R_{d2} \right\| \left( R_{o2} \right) \approx R_{o2} \]

Assume: Q1, Q2 identical

\[ I_{C1} = I_{C2} = \frac{V_{EE}}{2} \quad r_{m1} = r_{T2} = r_{T1} \quad r_{o1} = r_{o2} = r_{o} \]

\[ g_{m1} = g_{m2} = g_{m} \]

First, get DC operating pt.

\[ I_{C} = \frac{1}{g_m} \quad R_{EE} = 10 k\Omega \]

\[ I_{S} = I_{C} = \frac{1}{g_m} \quad V_{CC} = \frac{1}{g_m} \quad V_{EE} \]

\[ I_{T1} = I_{T2} = \frac{1}{g_m} \quad V_{EE} \]

\[ V_{S} = V_{EE} \]

\[ V_{S} = V_{EE} \]

\[ R_{S} = 1 k\Omega \]

Next, get AC operating pt.

\[ g_{m1} = g_{m2} = g_{m} \]

\[ s.s. ac ckt. \]

Inspection analysis might not work even there is feedback: e.g.,

\[ R_{EE} = 10 k\Omega \]

\[ I_{S} = 1 mA \]

\[ I_{C} = \frac{1}{g_m} \quad R_{EE} \]

\[ \frac{1}{g_m} \mid R_{EE} \mid 10 k\Omega \]

\[ I_{C} = 1 mA \]

\[ V_{EE} \]

\[ V_{S} = V_{EE} \]

\[ I_{S} = I_{C} = \frac{1}{g_m} \]

\[ I_{T1} = I_{T2} = \frac{1}{g_m} \]

\[ V_{EE} \]

\[ I_{S} = I_{C} = \frac{1}{g_m} \]

\[ V_{EE} \]

\[ I_{S} = I_{C} = \frac{1}{g_m} \]

\[ V_{EE} \]

\[ I_{S} = I_{C} = \frac{1}{g_m} \]

\[ V_{EE} \]

\[ I_{S} = I_{C} = \frac{1}{g_m} \]

\[ V_{EE} \]

\[ I_{S} = I_{C} = \frac{1}{g_m} \]

\[ V_{EE} \]
MOS Inspector Clue

- for now, ignore body effect (i.e., ignore $g_{mB}$)
- use the same inspection formulas as bipolar, but use $\beta \to \infty$, $r_{\pi} \to 0$, $m \to \infty$

MOS Inspection Analysis

For Common-Source Common-Drain Cascade

$$\frac{V_{d}}{V_{o}} = -g_{m} R_{d}, \quad g_{m} = \frac{m}{1 + g_{m} R_{f}}$$

$$\frac{V_{s}}{V_{o}} = \frac{g_{m} R_{f}}{1 + g_{m} R_{f}} = \frac{R_{f}}{g_{m} + R_{f}}$$

$$N_{d} = -g_{m} R_{d}, \quad G_{m} = \frac{g_{m}}{1 + g_{m} R_{f}}$$

$$N_{s} = g_{m} R_{f} = \frac{R_{f}}{g_{m} + R_{f}}$$

$$R_{d} = R_{0} \left[ 1 + g_{m} R_{f} \right]$$

$$R_{S} = 0$$

$$R_{d} = \frac{1}{g_{m}} V_{R_{f}}$$

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The image contains a circuit diagram and handwritten notes related to MOS Inspection Analysis. The notes include equations and comments. The key points are:

- The gain will be from 80-90% of what you calculate.
- The problem is with gmb in the source follower.
- Source Follower: (ω substituted grounded)
- Hybrid-II Model
- Vgs = Vgs + Vgs (–)
- Vce = Vce + Vce (–)
- Due to body effect

The diagram shows a circuit with various components labeled with symbols and equations.