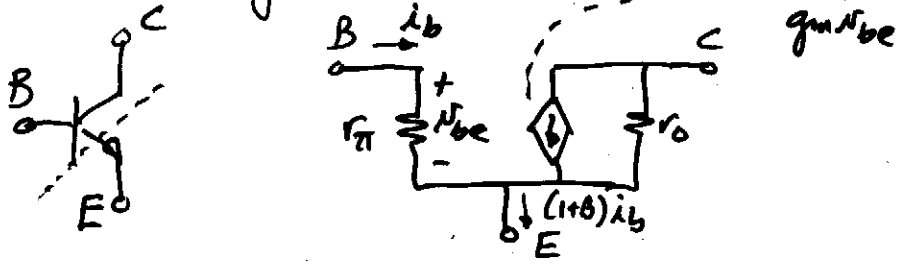
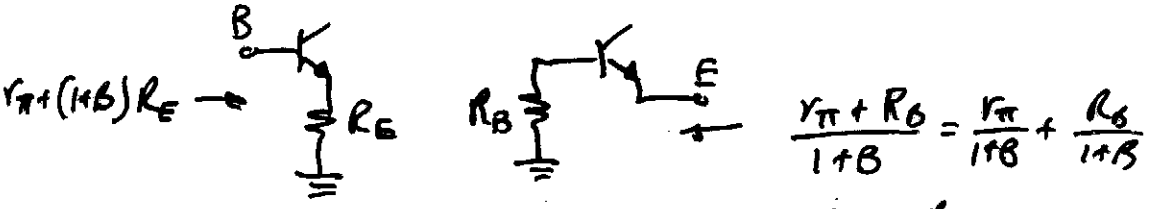
Summary of Chapter 13

- Common source and common emitter amplifier
- Midband small-signal (ac) performance/modeling
- Find small-signal model parameters as a function of operating (quiescent) point. (DC conditions)
- Convert from schematic to small-signal model (short power supplies, replace $C=\infty$ with shorts, remove dc current sources)
- Be able to find R_{in}, R_{out}, $\frac{v_{out}}{v_{in}}$, and $\frac{i_{out}}{i_{in}}$.

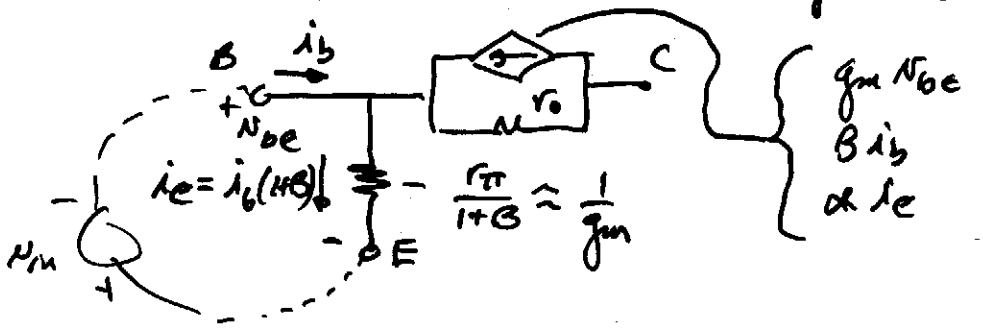
BJT small signal models –



E-B Impedance Reflection –

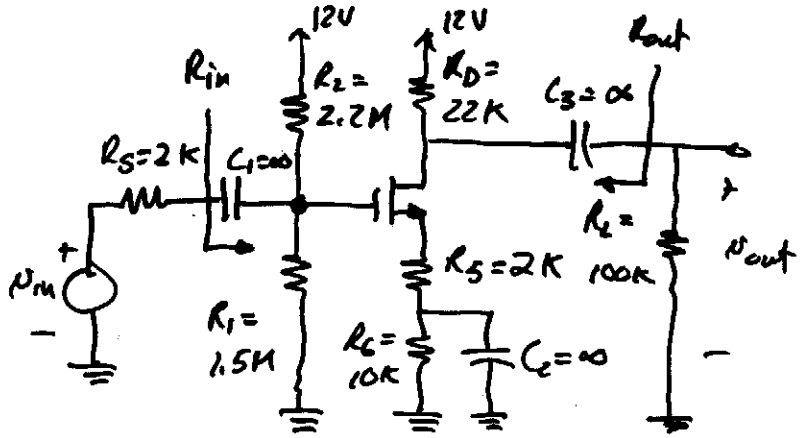


Tee Model



Chapter 14 – CC (CD), CB (CG) and Common Nothing

Example – Common Nothing MOSFET



Find $\frac{V_{out}}{V_{in}}$, R_{in}, and R_{out} if $K_N' = 500\,\mu A/V^2$, $V_{TN} = 1V$ & $\lambda_N = 0.02\,V^{-1}$

1.) Solve for the dc operating point (I_D, V_{DS}, & V_{GS}).

Solving the dc circuit gives $I_D = 241\mu A$, $V_{DS} = 3.81V$, and $V_{GS} = 1.922\,V$.

$$V_{GG} = \cancel{I_G^{\,0} R_{GG}} + V_{GS} + I_D(R_S + R_G)$$
$$I_D = K_N'(V_{GS} - V_{TN})^2$$

2.) $$g_m = \sqrt{2K_N I_D (1+\lambda V_{DS})} = \sqrt{2 \cdot 500 \cdot 241 \left(1 + \frac{3.81}{50}\right)} = 509\,\mu S$$

$$r_{ds} = r_o = \frac{\frac{1}{\lambda} + V_{DS}}{I_D} = \frac{50 + 3.81}{241}\,M\Omega = 223\,k\Omega$$

3.)