

(Due Sept. 14 by 6pm in homework locker)

1. Refer to Fig. P7.17. The transistors have $k'_n W/L = 3 \text{ mA/V}^2$, $V_t = 0.9 \text{ V}$.
 - (a) Find the required value of V_{CM} for the amplifier to operate with a 1mA dc bias current.
 - (b) Find the value of R_D to achieve a differential gain A_d of 10V/V.
 - (c) Determine the dc voltages at the drains.

 2. Design the circuit of Fig. 7.16 to provide a differential input resistance of at least 20k Ω . It also needs to have a differential voltage gain (output measured between both collectors) of 150V/V. Use $\beta = 100$ and a power supply of 12V.

 3. Design the circuit of Fig. 7.28(a) to achieve a gain of $v_o/v_{id} = 100 \text{ V/V}$ by finding the needed value for I. All transistors have $k' W/L = 3 \text{ mA/V}^2$ and $|V_A| = 30 \text{ V}$.

 4. Design the circuit of Fig. 7.32(a) using a basic current mirror configuration to implement the current source I. Use $\pm 6 \text{ V}$ power supplies. The equivalent transconductance needs to be 4mA/V. The BJT's have $\beta = 100$ and $V_A = 80 \text{ V}$. Draw the complete circuit with all component values. Determine the following:
 - (a) differential input resistance R_{id}
 - (b) output resistance R_o
 - (c) differential open-circuit voltage gain A_d
 - (d) input bias current

 5. Refer to Fig. P7.101. All transistors have $\beta = 150$, $|V_{BE}| = 0.7 \text{ V}$, and neglect the Early effect.
 - (a) Find the dc bias current in each of the 3 transistors. Also, find the dc output voltage v_o .
 - (b) Find the input and output resistances.
 - (c) Find the voltage gain v_o/v_i .
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