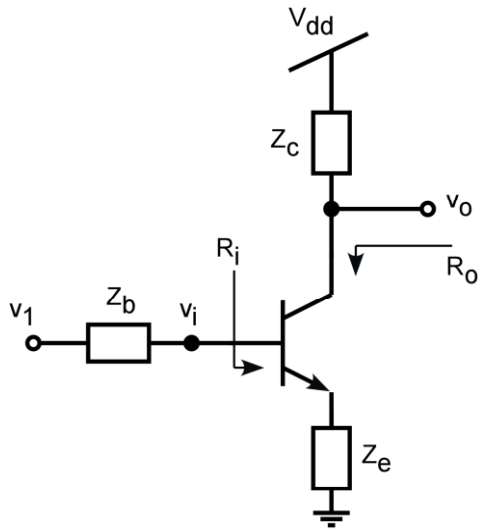
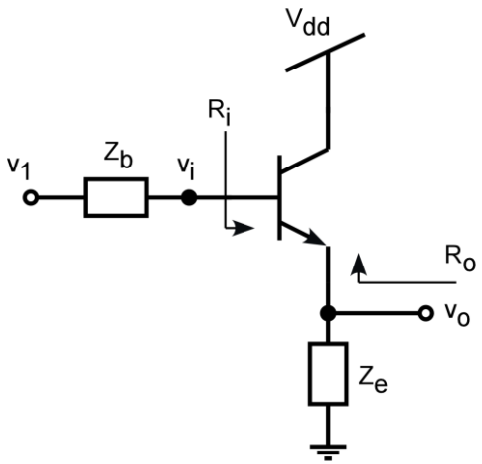
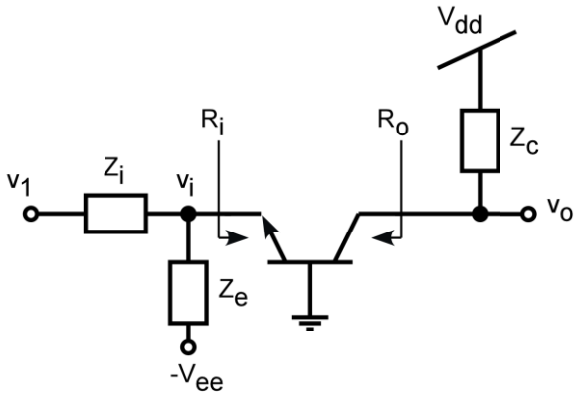
Last Lectures → Single Stage Amplifiers



Common Emitter - CE



Common Collector - CC



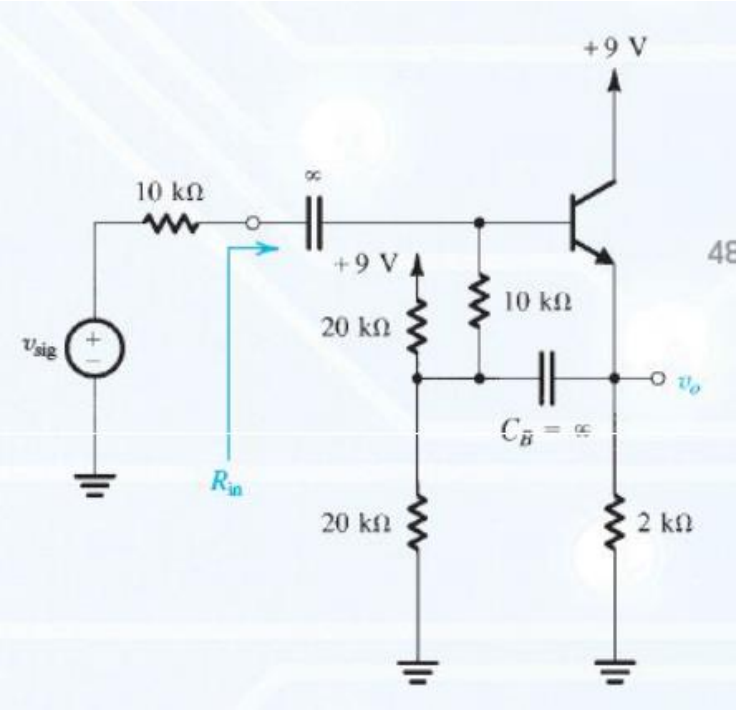
Common Base - CB

Single Transistor Bipolar Amplifier	Common-Emmitter CE	Common-Collector CC	Common-Base CB
Voltage Gain $A_v = \frac{v_o}{v_i}$	$\cong -\frac{g_m}{1+g_m Z_e} \cdot R_o // Z_c$	$\cong +\frac{g_m}{1+g_m Z_e} \cdot Z_e$	$= +g_m \cdot R_o // Z_c$
Input Resistance R_i	$= r_\pi (1 + g_m Z_e)$	$= r_\pi \ (1 + g_m Z_e)$	$\cong \frac{1}{g_m}$
Output Resistance R_o	$= r_o (1 + g_m Z_e)$	$\cong \frac{1}{g_m} + \frac{Z_b}{\beta_o + 1}$	$= r_o [1 + g_m (Z_i // Z_e)]$

Problem 6.154

For the given circuit, assume β=100 and V_{BE}=0.7V.

a) **Find the dc emitter currents and the small signal parameters.**
b) **Determine the overall voltage gain v_o/v_{sig} and the input resistance R_{in}.**
c) **Repeat b) for the case when capacitor C_B is open-circuited. Compare the results with those obtained in b).**



Problem 6.140

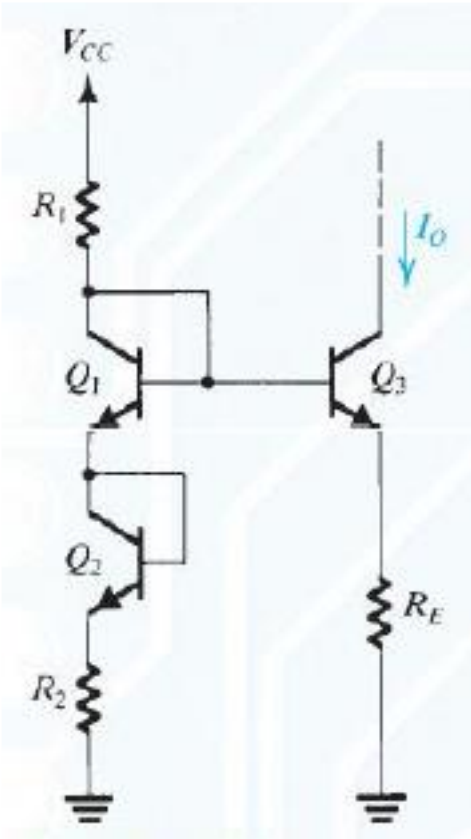
For the given circuit, assuming all transistors to be identical with β infinite,

a) derive an expression for the output current I_0, and show that by selecting $R_1=R_2$ and keeping the current in each junction the same, the current I_0 will be $I_0=V_{CC}/(2R_E)$

b) What must be the relationship of R_E to R_1 and R_2 be?

c) For $V_{cc}=10V$ and $V_{BE}=0.7V$, design the circuit to obtain an output current of 0.5mA.

d) What is the lowest voltage that can be applied to the collector of Q_3?



Problem 6.68

Assuming β=infinite, design the given circuit so that the bias currents in Q_1, Q_2, and Q_3 are 1mA, 1mA, and 2mA, respectively, and V_3=0, V_5=-2V, and V_7=1V.