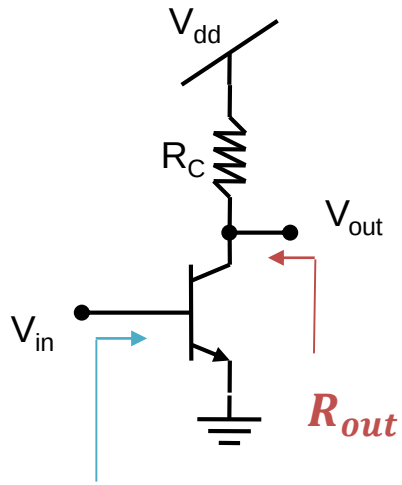
Last Lectures → CE & CC Amplifiers

- **Common Emitter**



$R_{out} = R_c//r_0$

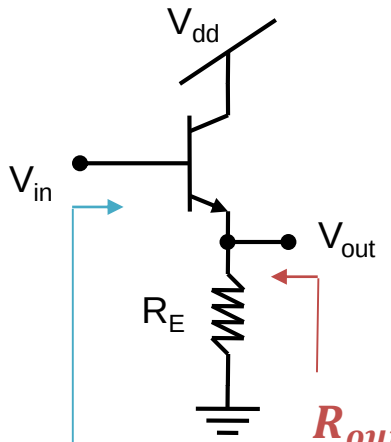
- *high output impedance*

$R_{in} = r_\pi$

$A_V = -g_m(R_c//r_0)$

- *High Gain!*
- *180⁰ Shift!*

- **Common Collector**



$R_{out} \approx 1/g_m$

- *Low output impedance*

$R_{in} = r_\pi(1+g_m R_E)$

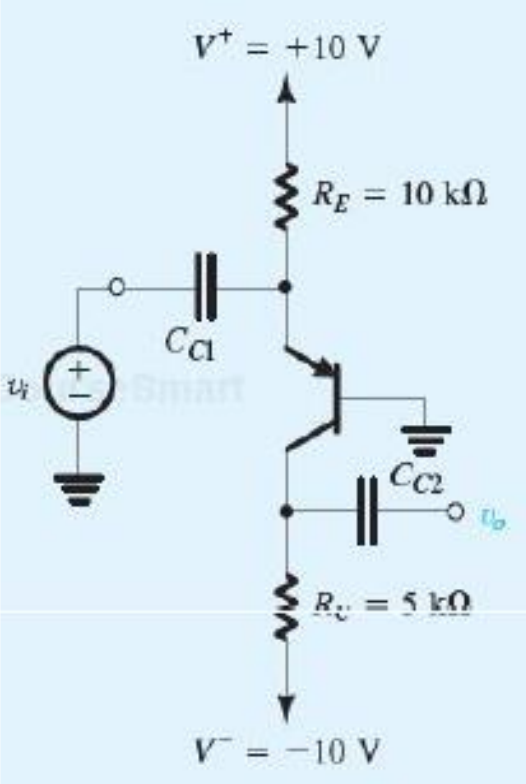
$A_V = \frac{g_m R_E}{1 + g_m R_E} \approx 1$

- *Gain <= 1*

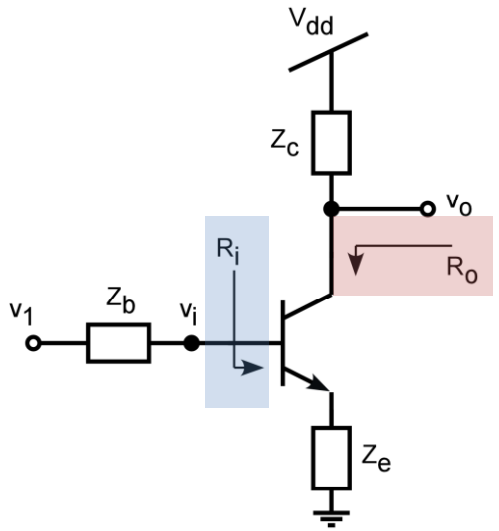
Exercise 6.44

For the following circuit determine

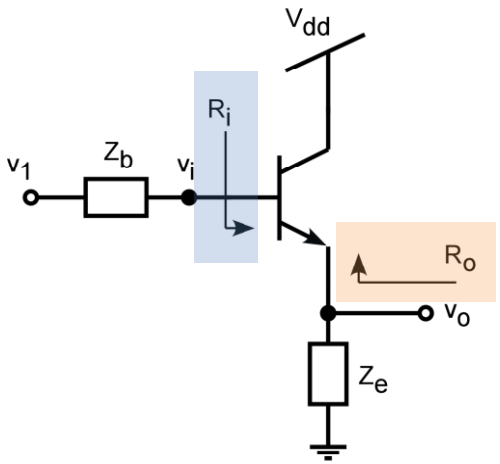
1. **the voltage gain v_o/v_i ($r_o=\infty$)**
2. **the impedance seen by the input source ($r_o=\infty$)**
3. **the output impedance**



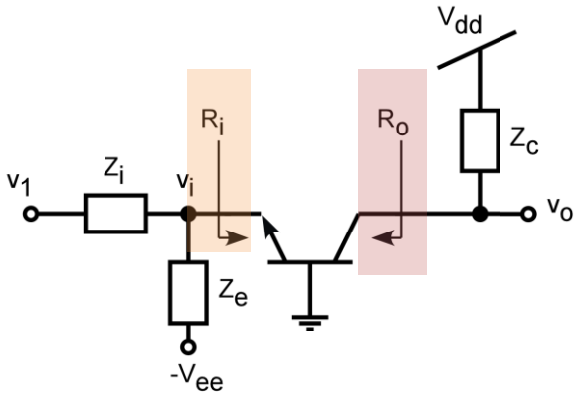
BJT – Single Stage Amplifiers



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 6.155

For the given circuit, let transistor Q_1 have β=50 and transistor Q_2 have β=100, and neglect the effect of r_o. Use V_{BE}=0.7V.

a) **Find the dc emitter currents of Q_1 and Q_2 along with the dc voltages V_{B1} and V_{B2}.**

b) **Assuming a load resistance R_L=1kΩ is connected to the output terminal, determine the overall voltage gain v_o/v_{sig} and the input resistance R_{in}.**