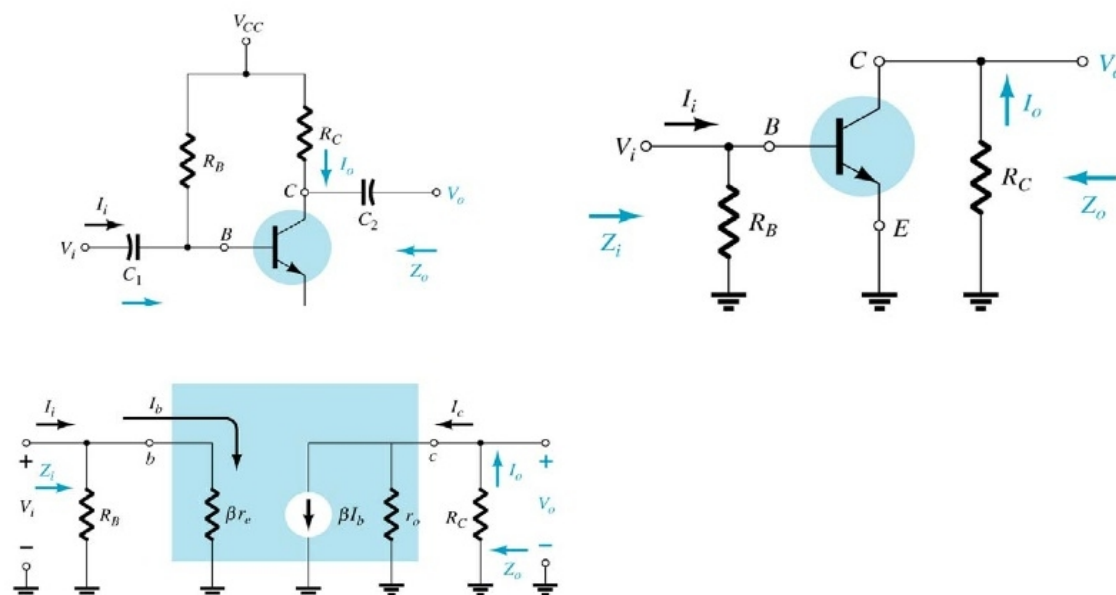


Process

Replace transistor with small-signal model.

Replace capacitors with short-circuits (at midband frequency caps have relatively low impedance)

Replace DC voltage sources with short-circuits. Replace DC current sources with open-circuits).



Help:
Close -> X

$$r'_e = \frac{25 \text{ mV}}{I_E} \quad r_c = R_C \parallel R_L$$

Emitter Biased

$Z_{in(\text{base})} = \beta R_E$

$Z_{in(\text{stage})} = R_1 \parallel R_2 \parallel \beta R_E$

$$A = \frac{R_C \parallel R_L}{R_E} = \frac{r_c}{R_E}$$

Emitter Bypass Cap

$Z_{in(\text{base})} = \beta r'_e$

$Z_{in(\text{stage})} = R_1 \parallel R_2 \parallel \beta r'_e$

$$A = \frac{R_C \parallel R_L}{r'_e} = \frac{r_c}{r'_e}$$

Emitter Biased, w/ swamping resistor & Bypass Cap

$Z_{in(\text{base})} = \beta(r'_E + r_e) \quad r_e \gg r'_e$

therefore $Z_{in(\text{base})} = \beta r_e$

$Z_{in(\text{stage})} = R_1 \parallel R_2 \parallel \beta r_e$

$$A = \frac{R_C \parallel R_L}{r_e} = \frac{r_c}{r_e}$$

Common Emitter

$Z_{out} = R_C \parallel R_L$

Common Collector

$Z_{out} = R_E \parallel R_L$

$$A = \frac{R_E \parallel R_L}{(R_E \parallel R_L) + r'_e} = \frac{r_e}{r_e + r'_e}$$