

EET-200L

Transistor Equations to Accompany Common Emitter A.C. Lab

Help:

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

Emitter Biased
 $Z_{in(base)} = \beta R_E$
 $Z_{in(stage)} = R_1 \parallel R_2 \parallel \beta R_E$
$$A = \frac{R_C \parallel R_L}{R_E} = \frac{r_C}{R_E}$$

Emitter Bypass Cap
 $Z_{in(base)} = \beta r'_e$
 $Z_{in(stage)} = R_1 \parallel R_2 \parallel \beta r'_e$
$$A = \frac{R_C \parallel R_L}{r'_e} = \frac{r_C}{r'_e}$$

Emitter Biased, w/ swamping resistor & Bypass Cap
 $Z_{in(base)} = \beta(r'_E + r_e) \quad r_e \gg r'_e$
therefore $Z_{in(base)} = \beta r_e$
 $Z_{in(stage)} = R_1 \parallel R_2 \parallel \beta r_e$
$$A = \frac{R_C \parallel R_L}{r_e} = \frac{r_C}{r_e}$$

Common Emitter
 $Z_{out} = R_C \parallel R_L$

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