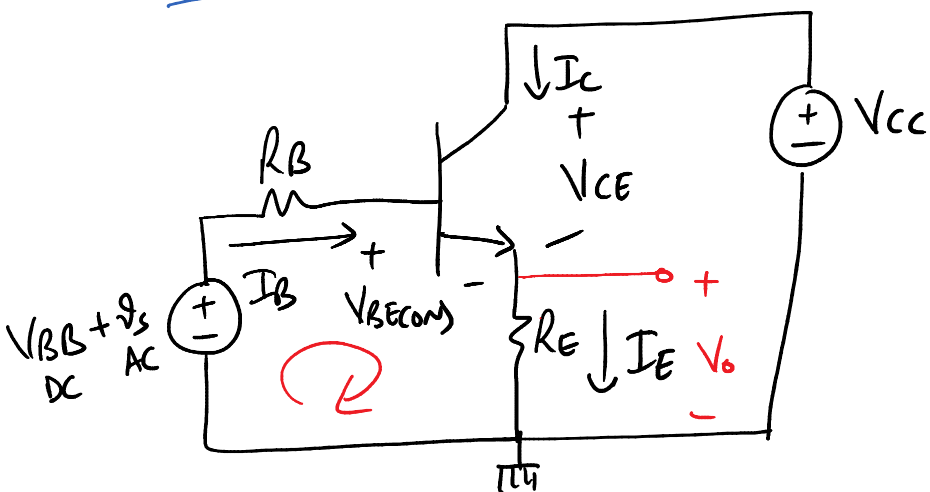
Monday, February 25, 2013
10:34 AM

LECTURE - 31

EMITTER FOLLOWER / COMMON COLLECTOR



KVL BE LOOP

$$-V_{BB} + I_B R_B + V_{BE(ON)} + I_E R_E = 0$$

$$I_E = (1+\beta) I_B$$

$$I_B = \frac{V_{BB} - V_{BE(ON)}}{R_B + (1+\beta) R_E}$$

$$I_C = \beta I_B$$

KVL CE LOOP

$$V_{CE} = V_{CC} - I_E R_E$$

$$V_o = I_E R_E$$

$$= (1+\beta) I_B R_E$$

$$= (1+\beta) \left[\frac{V_{BB} - V_{BE}}{R_B + (1+\beta) R_E} \right] R_E$$

If $(1+\beta)R_E >> R_B$

$$V_o \approx (1+\beta) R_E \left(\frac{V_{BB} - V_{BE}}{(1+\beta) R_E}\right)$$

$$V_o \approx V_{BB} - V_{BE} \approx V_{BB}$$

$\Rightarrow$ o/p $\approx$ i/p

< 1

* HIGH CURRENT GAIN
* USED AS A BUFFER!

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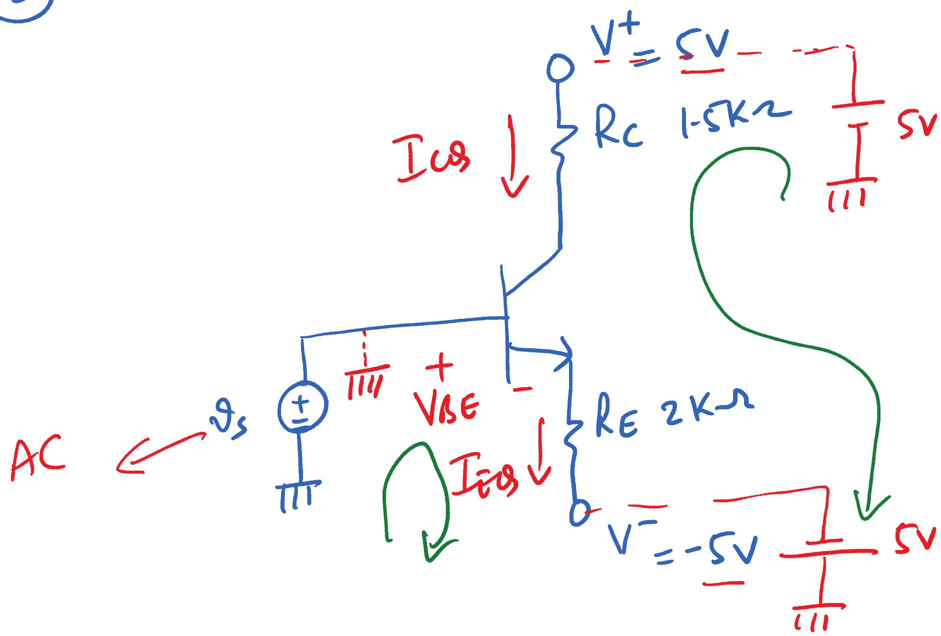
10:42 AM

POSITIVE AND NEGATIVE VOLTAGE BIASING

FOR DIFFERENTIAL AMPLIFIERS (OP-AMPS)

1. ELIMINATES THE NEED FOR COUPLING CAPACITORS
2. INPUT SIGNALS CAN BE DC



DC ANALYSIS SET $v_s = 0$, BASE TERMINAL IS GROUNDED

$\beta = 100 \qquad V_{BE}(on) = 0.7\,V$

KVL BE LOOP

$$V_{BE}(on) + I_{EQ} R_E - 5 = 0$$

$$I_{EQ} = \frac{5 - 0.7}{2K} = 2.15\,mA$$

$$I_{CQ} = \frac{\beta}{1+\beta} I_{EQ} = \left(\frac{100}{101}\right)(2.15m) = 2.13\,mA$$

KVL CE LOOP

$$-5 + I_{CQ} R_C + V_{CEQ} + I_{EQ} R_E - 5 = 0$$

$$V_{CEQ} = 2.51\text{V} > V_{CE(SAT)} = 0.2\text{V}$$

* ACTIVE REGION

* BASE IS AT GROUND POTENTIAL, BUT EMITTER IS TIED TO A NEGATIVE VOLTAGE THROUGH R_E TO -5 VDC