LECTURE 29

AMPLIFIER $\rightarrow \Delta$-POINT HAS TO BE SET IN THE ACTIVE REGION!

AC SOURCE IS NOT GROUNDED! NOISE PROBLEMS!

Vcc

??

Rc

Rb

Vbb

2 DC SOURCES!

NO ISOLATION BETWEEN AC AND DC SOURCES

AC SOURCE NEEDS TO BE AMPLIFIED

SMALL SIGNAL $\rightarrow$ $i_s$
1. Single Base Resistor Biasing

- DC Source

- $C_c$ is a coupling capacitor providing isolation between DC and AC sources.

- AC Source is grounded!
DC EQUIVALENT CIRCUIT!

CIRCUIT TO BE BIASED WITH 12V.

$V_{CEB} = 6V$

$\beta_{\text{active}} = 100$

$V_{BE\text{on}} = 0.7V$

$ICB = 1mA$

RC? RB?

**KVL CE LOOP**

$-V_{CC} + ICB \cdot RC + V_{CEB} = 0 \rightarrow LLB_{EB}.$

$RC = \frac{V_{CC} - V_{CEB}}{ICB} = \frac{12 - 6}{1mA} = 6k\Omega$

$IBB = \frac{ICB}{\beta} = \frac{1mA}{100} = 10\mu A$

**KVL RE LOOP**

$-V_{CC} + IBB \cdot RB + V_{BE\text{on}} = 0$

$RB = \frac{V_{CC} - V_{BE\text{on}}}{12 - 0.7} = 1.18\, M\Omega$
\[ R_B = \frac{V_{CC} - V_{BE(on)}}{I_{B}} = \frac{12 - 0.7}{10 \mu} = \frac{1.13 \text{M\Omega}}{\text{V}} \]

\[ \text{VERY LARGE!} \]
IF $I_{BS}$, FIXED THEN WHAT HAPPENS IF $\beta$ CHANGES??

$$I_{BS} = \frac{V_{CC} - V_{BE\,\text{on}}}{R_B} = \frac{12 - 0.2}{1.13\,\Omega} = 10\,\mu A$$

* $I_{BS}$ DOES NOT DEPEND UPON $\beta$

$$I_{CE} = \beta I_{BS}$$

$$V_{CES} = V_{CC} - I_{CE} R_C = 12 - I_C \times 6k$$

<table>
<thead>
<tr>
<th>$\beta$</th>
<th>50</th>
<th>100</th>
<th>500</th>
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</thead>
<tbody>
<tr>
<td>$I_{BS}$</td>
<td>0.5 mA</td>
<td>1 mA</td>
<td>1.5 mA</td>
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<tr>
<td>$V_{CES}$</td>
<td>9V</td>
<td>6V</td>
<td>3V</td>
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1. FOR A SINGLE BIAS RESISTOR, 8-POINT IS NOT STABILIZED AGAINST VARIATION IN $\beta$
2. VALUE OF $R_B$ FOUND IS NOT PRACTICAL!