



$$\begin{aligned}
 V_{BB} &= I_B R_B + V_{BE} + (I_B + I_C) R_E \\
 &= I_B R_B + V_{BE} + I_E R_E \\
 &= \frac{I_E}{\beta + 1} R_B + V_{BE} + I_E R_E \\
 I_E &= \frac{V_{BB} - V_{BE}}{\frac{R_B}{\beta + 1} + R_E} \approx I_C
 \end{aligned}$$

$$V_C = V_{CC} - I_C R_C$$

$$V_E = I_E R_E$$

$$\begin{aligned}
 V_B &= V_{BE} + V_E = V_{BE} + I_E R_E \\
 &= V_{BB} - I_B R_B
 \end{aligned}$$