
**P6.1** For the circuit shown in Figure 1, derive expressions for, and find the values of \( V_{BE}, I_C \) and \( I_E \), given \( I_B = 10\mu A, \beta_F = 200, \) and \( I_S = 10^{-17} \). Ignore base-width modulation.

**P6.2** The current gain of a BJT from the emitter to the collector is given by \( I_C/I_E \equiv \alpha_F \) when in the forward-active region, where \( \alpha_F = \beta_F/(1 + \beta_F) \). Use this to answer the following parts. Ignore base-width modulation.

a) Derive an expression for \( I_B/I_E \) in terms of only \( \alpha_F \).

b) We often approximate that \( I_E \approx I_C \). Given that up to a 5% error is acceptable, we can use the approximation of \( I_E \approx I_C \) by placing the following condition on \( \alpha_F \): \( \alpha_F > 0.95 \). What is the minimum value of \( \beta_F \) allowed that satisfies this condition? What is the minimum value of \( \beta_F \) if only a 1% error is acceptable?

**P6.3** J&B Problem 5.2. Ignore base-width modulation.

**P6.4** Find the values of base and collector currents \( I_B \) and \( I_C \) for the circuit shown in Figure 2, given that \( \alpha_F = 0.995 \). Ignore base-width modulation.
P6.5 J&B Problem 5.72.

P6.6 J&B Problem 5.82. In J&B, “Q-point” refers to the quiescent, or DC bias point. Ignore base-width modulation.

P6.7 J&B Problem 5.85. In J&B, “Q-point” refers to the quiescent, or DC bias point. Assume $V_{BE, on} = 0.7V$. Ignore base-width modulation.

P6.8 J&B Problem 5.87, part (a) only. Assume $V_{BE, on} = 0.7V$. Ignore base-width modulation.