1. A certain transistor has a β_{DC} of 200. When the base current is 50 μA, determine the collector current.

2. A BJT has α_{DC}= 0.99; I_B= 25 μA, and I_{CBO}= 200 nA. Find (a) the dc collector current, (b) the dc emitter current, and (c) the percentage error in emitter current when leakage current is neglected.

3. Determine I_B, I_C, I_E, V_{CE}, and V_{CB} in Figure 1 for the following values: R_B = 22 kΩ, R_C=220 Ω, V_{BB}= 6 V, V_{CC}= 9 V, and β_{DC}= 90.

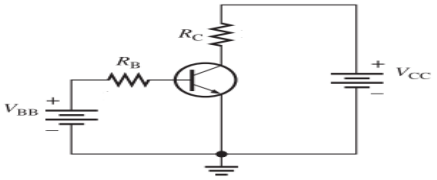

Figure 1

4. Determine whether or not the transistor in Figure 1 is saturated for the following values: β_{DC} = 125, V_{BB} = 1.5 V, R_B= 6.8 kΩ, R_C =180 Ω, and V_{CC}=12 V. Assume $V_{CE(sat)}$ = 0.2 V.

5. If $P_{D(max)}$=1 W, how much voltage is allowed from collector to emitter if the transistor is operating with I_C=100 mA?

6. The transistor in Figure 2 has the following maximum ratings: $P_{D(max)}$ = 500 mW, $V_{CE(max)}$= 25 V, and $I_{C(max)}$ = 200 mA. Determine the maximum value to which V_{CC} can be adjusted without exceeding a rating. Which rating would be exceeded first?

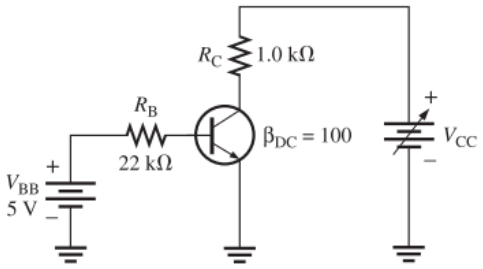

Figure 2

7. A transistor has a $P_{D(max)}$ = 5 W at 25°C. The derating factor is 10 mW/°C. What is the $P_{D(max)}$ at 70°C?

8. A transistor connected as in Figure 3 has an r'_e= 20 Ω. If R_C is 1200 Ω, what is the voltage gain?

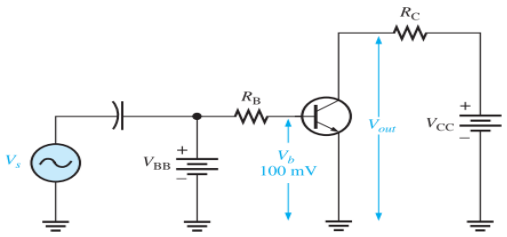

Figure 3

9. Determine the minimum value of I_B required to saturate the transistor in Figure 4 if β_{DC} is 125 and $V_{CE(sat)}$ is 0.2 V.

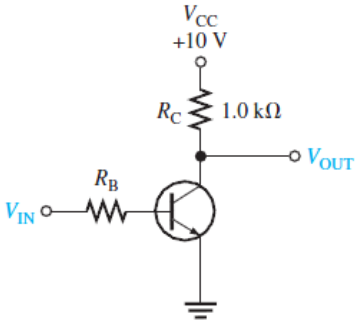

Figure 4

Design Problems

10. The transistor in the circuit of figure 5 has β = 100 and exhibits a V_{BE} of 0.7 V at I_C = 1 mA. Design the circuit so that a current of 2 mA flows through the collector and a voltage of +5 V appears at the collector.

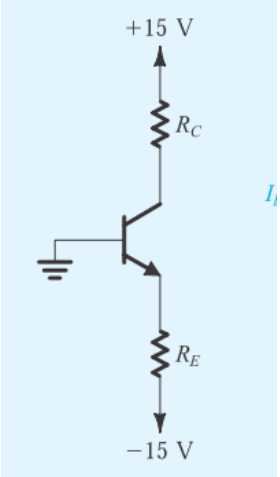

Figure 5