Sheet 3: Bipolar Junction Transistors (BJTs)

1- A transistor given in Figure 1 with $\beta = 100$. If $V_{CC} = 10V$, $R_C = 2.7K\Omega$, $R_B = 180K\Omega$. Determine the value of the collector-to-emitter voltage (V_{CE}) and the collector current (I_C).

2- The circuit shown in Figure 2 uses a transistor with $\beta = 100$, $R_C = 0.5K\Omega$, $R_E = 1K\Omega$, $R_B = 44K\Omega, V_{CC} = 15V$, $V_{EE} = -15V$, $and\ V_{BB} = 0$. Determine the value of the collector voltage (V_C) and the emitter voltage (V_E).

3- The circuit shown in Figure 2 uses a transistor with $\beta = 50, R_C = 0.5K\Omega$, $R_E = 1K\Omega$, $R_B = 44K\Omega, V_{CC} = 5V$, $V_{EE} = 0$, $and\ V_{BB} = -2V$. Determine the value of the collector voltage (V_C) and the emitter voltage (V_E).

4- For the circuit shown in Figure 2, determine the value of the collector-to-emitter voltage (V_{CE}) and the collector current (I_C). When a transistor has $\beta = 100$. Assume $R_C = 1K\Omega, R_B = 270K\Omega$, $R_E = 1K\Omega$, $V_{CC} = 0$, $V_{EE} = -10V$, $and\ V_{BB} = 0$.

5- For the circuit shown in Figure 3, determine the value of R_B to yield $I_C = 5mA$. Assume $\beta = 60$, $V_{EB} = 0.7V, R_C = 0.5K\Omega$, $R_E = 100\Omega, V_{CC} = -6V$.

6- If $\alpha = 0.97$ and $V_{BE} = 0.7V$, find R in the circuit shown in Figure 4 to yield $I_E = 2mA$, $R_C = 2K\Omega, R_E = 100\Omega, R_1 = 25K\Omega, V_{CC} = 10V$.

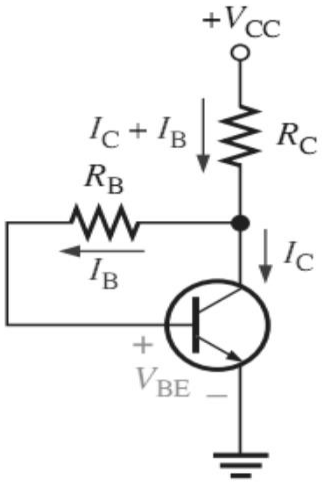

Figure 1

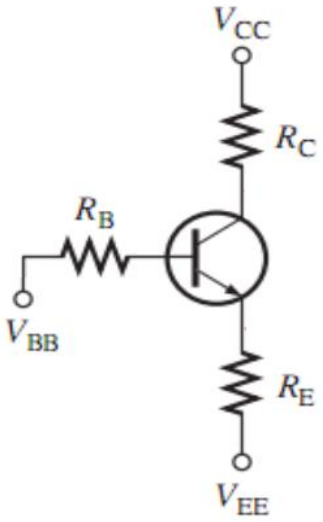

Figure 2

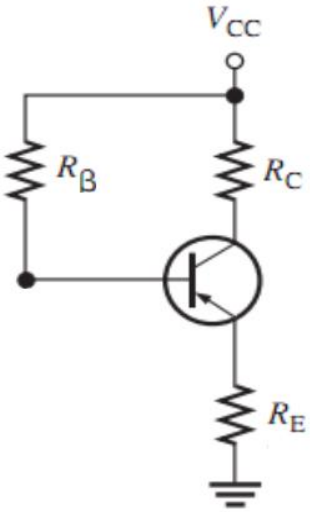

Figure 3

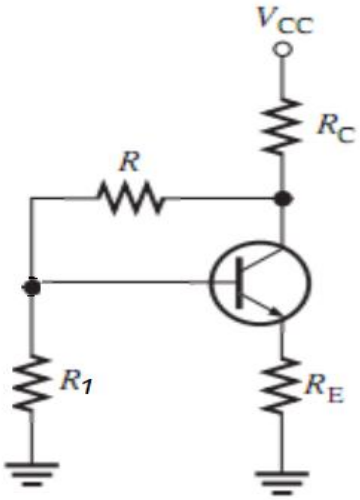

Figure 4