Problem 4.35

Consider the circuit shown below. A Q-point value for $I_C$ between a minimum of 4 mA and a maximum of 5 mA is required. Assume constant resistor values, and suppose that $\beta$ ranges from 100 to 300. It is desired that $R_B$ have the largest possible value while meeting the other constraints. Find the values of $R_B$ and $R_E$. The resistors in this problem are not required to be nominal values.

Problem 4.38

Find $I_C$ and $V_{CE}$ in the circuit below.

Problem D4.39

Four-resistor bias circuit design. Suppose that $V_{cc} = 20V$, $R_C = 1 \, k\Omega$, and a Q-point of $I_{CQ} = 5 \, mA$ is desired. The transistor has $\beta$ ranging from 50 to 150. Design a four-resistor bias circuit. Use standard 5% tolerance resistors.
Problem 4.43

Why are coupling capacitors often used to connect the signal and the load to discrete amplifiers circuits? Should coupling capacitors be used if it is necessary to amplify dc signals? Explain.

Problem 4.45

Consider the common-emitter amplifier in the figure below. Draw the dc circuit and find \( I_{CQ} \). Find the value of \( r_{\pi} \). Then calculate the values for \( A_v \), \( A_{vo} \), \( Z_{in} \), \( A_i \), \( G \) and \( Z_o \). Assume the amplifier is operating in the midband region for which the coupling and bypass capacitors are short circuits.

![Common-emitter amplifier circuit](image)

Problem 4.49 a)

Draw the small-signal equivalent circuit for the circuit shown below.

![Small-signal equivalent circuit](image)

Problem 4.51

Consider the emitter-follower amplifier in the figure below. Draw the dc circuit and find
\( I_{CQ} \). Find the value of \( r_e \). Then calculate the midband values for \( A_v \), \( A_{vo} \), \( Z_{in} \), \( A_i \), \( G \) and \( Z_o \).