1. Design a cascode amplifier with a small signal midband gain equal to $-10$. The input impedance at midband is to be $20\,k\Omega$ and the output impedance $3\,k\Omega$. Bias the circuit so that the voltage at the base of $Q_1$ is $5\,V$ and the base of $Q_2$ is $10\,V$. The DC collector current in $Q_1$ is $1\,mA$. Pick the parallel combination of $R_3$ and $R_4$ to be $30\,k\Omega$. For the hand calculations assume that the $\beta = \infty$ for both transistors and that $V_{BE} = 0.65\,V$. Perform a SPICE simulation for the DC operating point, small signal gain versus frequency, clipping behavior, and the output noise. Use $V^+ = 15\,V$, $C_1 = 10\,\mu F$, $C_2 = 10\,\mu F$, $R_L = 10\,k\Omega$, and $C_E = C_B = 100\,\mu F$. For the SPICE simulation do not assume that $\beta = \infty$. Instead, use the SPICE parameters given on page 38 in the lab manual.