# ELEC301 Problem Set #3



1) For the circuit shown in figure 1, use the 1/3rd rule with $V_B = V_{CC}/3$ to find $R_{B1}$, $R_{B2}$, $R_C$, and $R_E$ given that $V_{CC} = 15\text{V}$ and $I_C = 2\text{mA}$.

2) For the circuit shown in figure 1, use the 1/3rd rule with $V_E = V_{CC}/3$ to find $R_{B1}$, $R_{B2}$, $R_C$, and $I_C$ given that $R_E = 8\text{k}\Omega$ and $V_{CC} = 12\text{V}$.
(Answers: $R_{B1} \approx 146\,\text{k}\,\Omega$, $R_{B2} \approx 104\,\text{k}\,\Omega$, $R_C \approx 8\,\text{k}\,\Omega$, and $I_C \approx 0.5\,\text{mA}$)

3) What are $g_m$ and $r_\pi$ for the transistors in P1 and P2 above?
(Answers: P1 $g_m = 80\,\text{m}\,\Omega^{-1}$ and $r_\pi = 1.25\,\text{k}\,\Omega$; P2 $g_m = 20\,\text{m}\,\Omega^{-1}$ and $r_\pi = 5\,\text{k}\,\Omega$)

4) Assuming that a small-signal a.c. voltage source with a 50Ω source impedance is coupled to the amplifier of P2 above via a 10μF coupling capacitor and that $R_E$ is by-passed using a 50μF capacitor and that the hybrid- model has the following parameters $c_\pi = 10\text{pF}$, $c_\mu = 2\text{pF}$, and $r_o = \infty$, what are $A_M$, $\omega_{3\text{dBL}}$, and $\omega_{3\text{dBH}}$?
(Answers: $A_M \approx -158$, $\omega_{3\text{dBL}} \approx 400/s$, and $\omega_{3\text{dBH}} \approx 4.4\times10^7/\text{s}$)

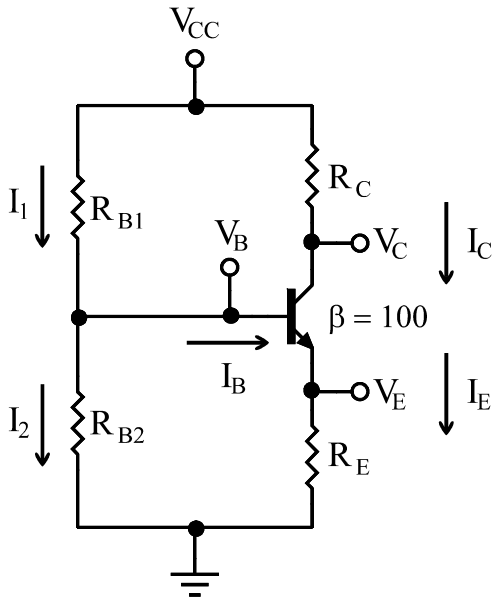


Figure 1.

5) For the circuit shown in figure 2:
   i. Draw the low frequency circuit, the midband circuit and the high frequency circuit and
   ii. Derive the complete transfer function using $I_E \approx I_C = 2\text{mA}$, $c_\pi = 10\text{pF}$, and $c_\mu = 2\text{pF}$.

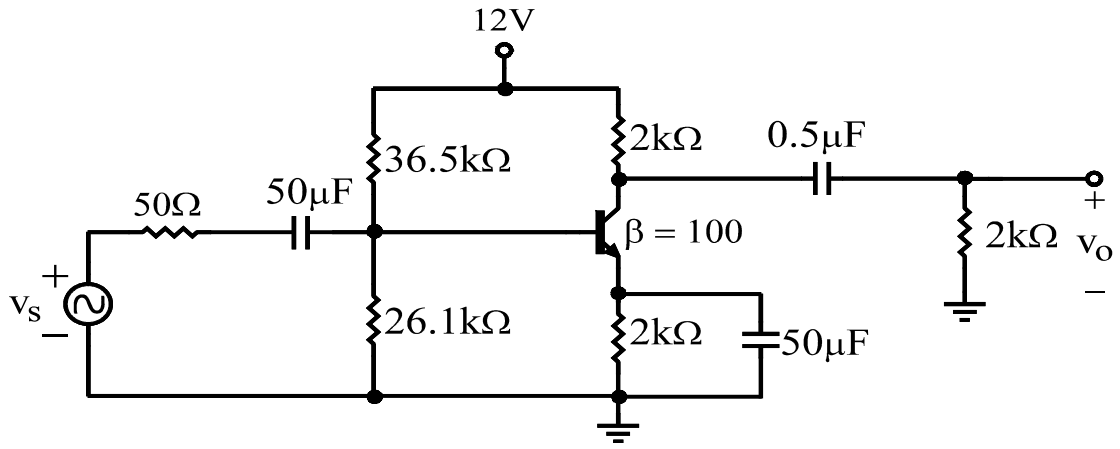


Figure 2.