HACETTEPE UNIVERSITY
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
ELE-313 ELECTRONICS LABORATORY II

EXPERIMENT – 3 DIFFERENTIAL AMPLIFIERS

PRELIMINARIES:

For detailed information about differential amplifiers, Electronic devices and circuit theory, Louis Nashelsky and Integrated Electronics, Jacob Millmann are advised.

1. What are the definitions of single ended AC voltage gain, double ended AC voltage gain, common mode, difference mode and common-mode rejection ratio (CMMR)?
2. Assume the total resistance of potentiometer R_{AB} between Q1, Q2 and Q3 are 200Ω, since Q1 and Q2 has equal h_{fe} and their R_Cs match perfectly, both input sides of the potentiometer are well balanced which means $I_{CQ1}=I_{CQ2}$ and the resistances R_{AC} and R_{BC} are same and equal to 100Ω. Make DC analysis of the given circuit and determine the currents $I_{CQ1}+I_{CQ2}=I_{CQ3}$. It is known that h_{fe} of transistors equals 65, V_{BE}=0.6V and r_o=200KΩ
3. Find single ended common mode, difference mode gain and CMMR in figure.
4. For Pspice simulations apply the following inputs and measure the outputs
   - Set V_{i1} to 50 mV peak at 1kHz and connect V_{i2} to the ground. Measure and plot the AC voltage between the middle pin of the potentiometer and ground. Connect the each channel of the oscilloscope to the V_{o1} and V_{o2} plot the results, obtain the phase difference between the outputs and find the single ended gain.
   - Set V_{i2} to 50 mV peak at 1kHz and connect V_{i1} to the ground. Measure and plot the AC voltage between the middle pin of the potentiometer and ground. Connect the each channel of the oscilloscope to the V_{o1} and V_{o2} plot the results, obtain the phase difference between the outputs and find the single ended gain.
   - Set both input voltages to 1V peak at 1kHz. Measure and plot the AC voltage between the middle pin of the potentiometer and ground. Connect the each channel of the oscilloscope to the V_{o1} and V_{o2} plot the results, obtain the phase difference between the outputs and find the gain.

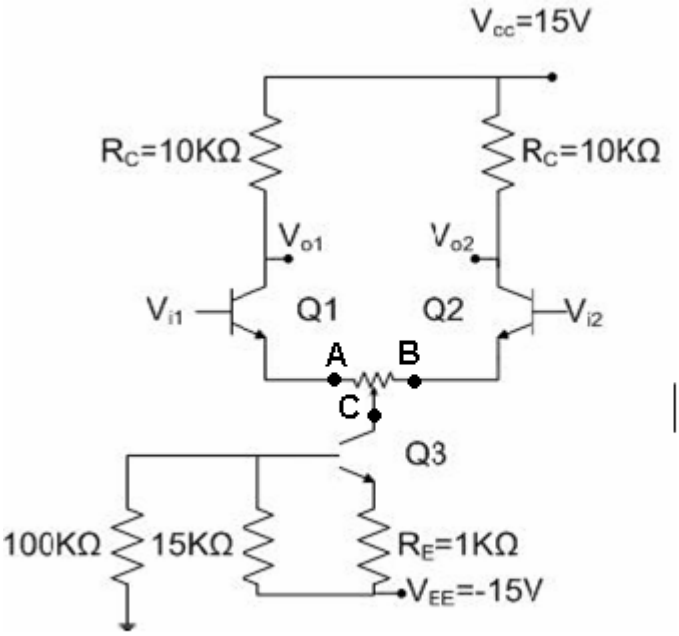

Figure: Differential Amplifier

Metehan Bulut – Hasan Hüseyin Özbenli
Mehmet Hakan Akşit – Hıdır Aşkar
Fall 2010