

BONUS ASSIGNMENT FOR THE ELEC 312 (ELECTRONICS-II) COURSE

(Fall 2013 term)

Electrical and Computer Engineering Department Concordia University

Use a circuit simulation software package (i.e., student version of PSpice program) to design an operational amplifier (OP-AMP) using BJT devices. Include the following in your work:

1. Design for a low frequency Gain > 60 dB (i.e., 1000 V/V) including one differential amplifier stage, 1-3 single stage amplifiers, one output stage (class A), and a bias current source.
2. Show design equations for each stage and provide verification of the design goal from simulated results. This is *validation*.
3. Measure CMRR, input resistance and output resistance. *Validate* your measured results.
4. Using two pole model for the gain of each stage, write the expression for the voltage transfer function of the overall system.
5. Discuss the stability issue of your design using the concept of gain and phase margin.

Submit a report (including signed declaration of originality) to Dr. Raut (course instructor) by **November 26, 2013** (4:00pm).