RUTGERS UNIVERSITY
Department of Electrical and Computer Engineering
332:577 Analog and Low-Power Digital VLSI Design Analog Project Using TSMC 0.18 μm Process
Spring, 2006

1. Design a CMOS OPAMP with a bandwidth of $1MHz$, a phase margin of 60^o, and a gain of 1500. Use a single bandgap referenced current source for all current sources in your OPAMP, so that all references in the OPAMP are supply voltage and temperature independent. By May 1, 2006, turn in the following:

   (a) Analog schematic for OPAMP.

   (b) Analysis of all equations for OPAMP, with a systematic derivation of all transistor W/L ratios.

   (c) Spectre simulation of circuit schematic for OPAMP.

   (d) Cadence layout for OPAMP chip.

   (e) Spectre simulation of circuit extracted from the layout.

   (f) Analog test waveforms for your OPAMP.

   (g) Calculate the following parameters for your OPAMP: DC gain, Bode plot for AC gain and phase, CMRR, PSRR, input and output voltage ranges, power consumption, and input-referred offset voltage.

2. On April 21, 2006 you must submit a project proposal for your large analog project for this course. Late proposals will be severely penalized. This is one of three major projects in the course. Possible project suggestions (but other projects are possible as well):

   (a) 5-bit Flash A/D converter.

   (b) 16-bit Successive approximation A/D converter.

   (c) 16-bit D/A converter.

   (d) Phase-locked loop (recommended for a team of 2 people).

   (e) Analog Gilbert cell multiplier (done in CMOS).

   (f) 8-bit μ-law CODEC (recommended for a team of 2 people).

   The large analog project is also due on May 1, 2006.