REVIEW FOR FINAL EXAMINATION

The final examination will be held on Friday, May 2, 2003 from 2:50pm to 5:40pm in Room C456 of Van Leer. The exam is closed book and you are permitted four sheets of notes (three of which are your sheets for the 3 midterms plus a new sheet for the final exam). The exam will consist of 8 problems of which 6 problems, each worth 20 points for a total of 120 points, must be worked. The 8 problems will fall into two categories, those you must work and those you may work. Below is a list of the material for which you are responsible. Because the final is on the last period, it will be separated physically into two parts to enable your instructors to grade it by the deadline. Dr. Allen will be responsible for four of the problems and Dr. Ayazi for the remaining four. The instructors names with the areas listed below indicate the area of potential questions for which instructor is responsible.)

Output Stages (Dr. Allen and Dr. Ayazi)

Emitter and source follower
- Transfer characteristics, power output and efficiency, input/output resistance
- Distortion

Push-Pull stages – BJT and MOS and BiCMOS
- Class B and Class AB
- Transfer characteristics, power output and efficiency, input/output resistance
- Distortion

Quasi-complementary output stages
Overload protection
Common source configuration with error amplifiers

Frequency Response (Dr. Allen and Dr. Ayazi)

Frequency response of single-stage amplifiers
- Miller approach to finding –3dB frequency
- Exact analysis for two poles
- Dominant pole approach to finding –3dB frequency

Frequency response of the differential amplifier
- Differential, common mode and CMRR

Frequency response of voltage buffers
- Emitter follower
- Source follower
- Voltage gain, input impedance, output impedance

Frequency response of current buffers
- Current gain

Multistage amplifier frequency response
- Dominant pole approximation
- Open-circuit (zero value) time constant analysis
- Short-circuit time constant analysis

Operational Amplifiers (Dr. Allen and Dr. Ayazi)

Basic concepts of an op amp, specifications
Compensation of a two-stage op amp using Miller or nulling Miller compensation
Analysis and design of a two-stage op amp
Analysis and design of a folded-cascode op amp and the concept of self compensation
Cascode op amps
Static op amp limitations, CMRR, PSRR, offset, etc.
741 op amp - analysis, design, application
Frequency response of op amps

Slew rate of op amps
Measurement and simulation of op amps

High Performance Op Amps (Dr. Allen)

Low output resistances op amps - MOS with and without feedback, BJTs
High speed/frequency op amps
Differential output op amps - common mode output voltage stabilization
Micropower op amps, op amps operating in weak inversion
Low voltage circuits and operational amplifiers
How to improve the performance of an op amp in general and what tradeoffs are necessary

Feedback (Dr. Ayazi)

Recognize feedback loops and the differences between positive and negative feedback
Identify and classify the four types of amplifiers and their associated feedback topologies
Determine the effect of negative feedback upon amplifier performance
Calculate the loop gain while accounting for the loading of the feedback network
Be able to use the return ratio method to calculate the closed loop gain of a feedback circuit
Use Blackman's formula to determine resistance at a port
Understand the limitations of negative feedback
Understand the benefits of controlled positive feedback

Comparators (Dr. Allen)

Characterization of comparators - resolution, propagation delay, swing, offset
Single stage comparators - inverter and differential amplifier
Two-stage comparators - output swings, propagation delay, gain, input common mode
Improved comparators - folded cascode
Autozeroing
Hysteresis
High speed comparators