REVIEW FOR FINAL EXAMINATION

The final examination will be held on Tuesday, 27, 2004 from 2:50pm to 5:40pm in Room C341 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 7 problems of which 5 problems, each worth 20 points for a total of 100 points, must be worked. The 7 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. Dr. Allen will be responsible for three of the problems and Dr. Rincon-Mora for three more of the problems and there will be one more problem asking you to state what you learned in the IEEE SSC Chapter meeting on the evening of 4/22/2004. The instructors names with the areas listed below indicate the area of potential questions for which instructor is responsible.

Output Stages (Dr. Allen)

- 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. Rincon-Mora)

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. Rincon-Mora)

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. Rincon-Mora)
- 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. Rincon-Mora)
- 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