ECE 421/521 Study Guide #6 4 November 2014

Quote Jim Davey: “...performance is nearly adequate most of the time.”

Topic for this week: A10dB gain 100 mW audio amplifier for a 32 ohm load, Midterm Design using a circuit of your choice.

Homework: Continue design of your amplifier using LTSpice and hand analysis of power supply requirements, distortion, gain, power dissipation of individual components, the effect of component tolerances, etc.

Midterm exam questions will be taken from the following topics:

1. Starting with a blank sheet of paper. Closed book, no notes. Draw figure 1.18 and write simple expressions for \( r_p \), \( g_m \) and \( r_o \). Calculate each for a collector current of 2 mA.

2. Starting with a blank sheet of paper. Closed book, no notes. Sketch figure 1.19 and discuss the importance of \( r_b \) in noise performance of a transistor. Then discuss the importance of the various capacitors to frequency response.

3. Starting with a blank whiteboard or back of an envelop in a coffee shop, sketch figure 1.35a and describe how a MOS transistor works. Include behavior at zero voltage, sub-threshold, inversion, and weak inversion.

4. Explain why \( C_{gs} \) is dominant in CMOS analog circuits.

Midterm exam Monday. Bring to the exam a completed design of an amplifier that meets a set of specifications clearly stated in your design. You have some flexibility as the designer, but gain must be at least 10 dB, frequency response must be adequate for the audio range, and the amplifier must deliver at least 100 mW to a load impedance of 32 ohms or more. These assigned specs are flexible, but yours must be specific and backed up by simulations and analysis. Distortion must be acceptable and shown using simulations.

Bring four pages describing your design to the exam--these four pages will be handed in with the exam.

Midterm exam date:

In Class November 10.