

## Concepts to review for the Physics 140 Final Exam

**Lab notes and exercises:** A list of the important concepts taught in each lab are listed below. Review the lab notes and also the lab exercises. Note that many of the optional exercises make great final exam problems!

Ohm's law, ground, open vs closed circuits, parallel and series resistance.

Voltage dividers, input and output resistance, combining input and output devices

RC time constants, exponential decay, high/low-pass filters.

Silicon diodes: threshold voltage = 0.6 V, LEDs, rectification

AC-DC power conversion: AC and rms quantities, half and full-wave rectifiers, transformer, diode bridge, voltage regulator.

Transistors and MOSFETs: npn (3904) vs pnp (3906) BJTs, n-type and p-type MOSFETs, follower circuits, amplifiers, power switching.

Opamps circuits, open-loop gain, negative feedback, inverting and non-inverting amplifiers, voltage-follower, maximum output current, summing and difference amplifiers, integrator and differentiator, clamp, current source and sink.

555 timer: inputs, outputs, & controls, charge and discharge times, switching thresholds, oscillator, pulse generator, modulated vibrator.

Logic gates (AND, OR, NAND, NOR, NOT, XOR), truth tables, construct new gates from other gates.

7474 flip-flops, shift-register, binary counter, delay propagation, division counters.

Counters and clock signals, decade counter, decoder, LED display, bounceless switch.

D/A conversion, summing amplifiers, decibel gain

Recall that the audio amplifier project combined many different aspects of the course.

**A simple equipment review** can strongly influence your performance on the exam.

- a) Make sure that you understand your oscilloscope (dual channel operation, triggering, AC vs. DC input), multimeter (voltage vs. current measurements, resistance and capacitance measurements) and signal generator (high/low/TTL, DC bias, etc).
- b) Know how to read resistors and capacitors.
- c) Remember how to orient diodes and electrolytic capacitors.
- d) Remember how your button switches and potentiometer work (make diagrams).
- e) Spend some quality time with your transistors. Which lead is which?
- f) Review the chip pinouts. Be familiar with the details and potential pitfalls of each one.