Physics 313 final exam review, Fall 2016

Written part: Tuesday, Oct. 11
practical part (open logbook) : by arrangement with me; will include debugging a circuit. Must be completed by 10/21.

Allowed materials: calculator, writing and erasing implements, two 3" x 5" index cards (e.g. card from first exam plus a new card).

Questions will emphasize the material covered in the second half of the course, but anything in the course (readings, lectures, labs, homework) is fair game. You will see a diode problem!

Topics from second half of course:

<u>Transistors</u>

- Diode check results; rules for operation (conditions on V_{CE} , V_{BE}), current gain (β or h_{FE})
- Characteristic curves (I_C vs. V_{CE} for different I_B); what they look like, what they tell you; saturation region; cutoff region
- Transistor circuits: emitter follower, common-emitter amplifier: quiescent points (biasing), current and/or voltage amplification—simple versions, what output for a given input looks like, input and output impedance
- Be able to explain in words (supplemented by equations and sketches, if you wish) the chain of reasoning that gives us the expression $-R_C/R_E$ for the gain of a common-emitter amplifier, starting with V_{in} increasing by a small amount ΔV_{in}.

<u>Op amps</u>

- terminology: inverting input, non-inverting input, negative feedback, virtual ground, open-loop gain
- typical open-loop gain (e.g. number)
- input and output impedances of the ideal op-amp
- Golden Rules and the conditions under which they hold
- analyzing circuits using Golden Rules (figuring out V_{out} given input)
- behavior and characteristics of specific circuits: follower, inverting amplifier, non-inverting amplifier, differentiator, integrator, current-to-voltage converter
- slew rate