Exam #2 reading:

- Alciatore Chapters 3 and 4
- Simpson Chapter 4.

Subjects for exam #2:

- Semiconductor Physics
- Diodes
- Zener Diodes
- BJT w/ common emitter
- MOSFETs as switches
- Circuit analysis for the above circuit elements
- Fourier Series
- Fourier Synthesis
- Bandwidth
- Decibels
- Filters (high, low, and band pass)
- System response for (0^{th}, 1^{st}, 2^{nd} order systems) including resonance and effect on signal passing through.

Sample exam questions for Electronics.

Practice Electronics Exam #2

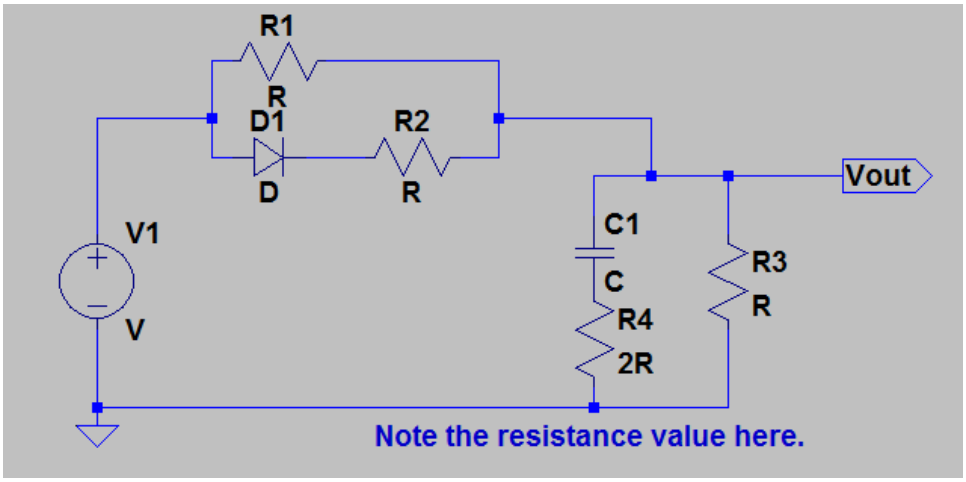
Semiconductors: devices and circuits; System response.

- Please give complete answers that explain/justify your result. You will not receive partial credit without doing so. You are free to use your notes and book but no other source.
- Write all work on the blank paper provided and staple your exam questions to your solutions.

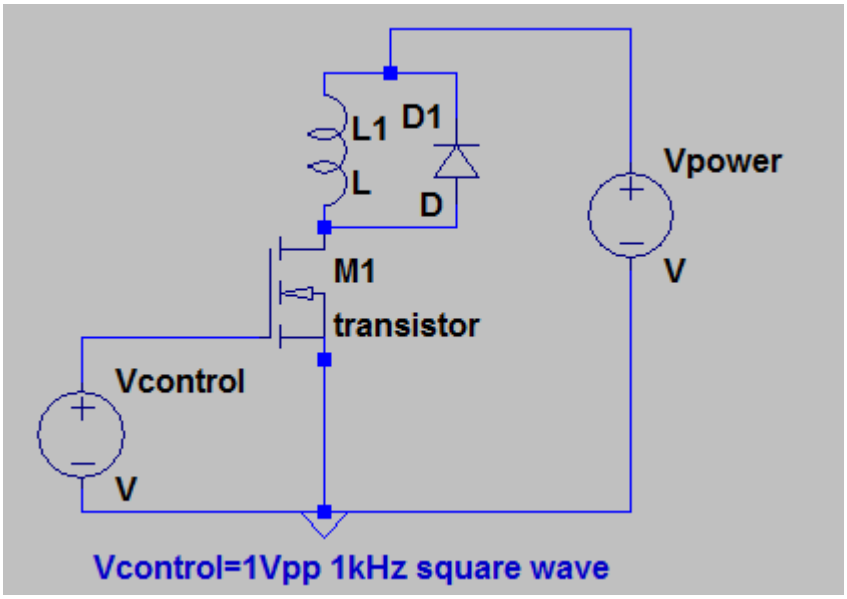
1. Working from first principles based on semi-conductor physics the current through a diode is given by

$$I_D = I_o\left(e^{\frac{qV_D}{k_bT}} - 1\right)$$

   How does the temperature of the diode effect the resistance to flow through the diode?
2. For the following circuit, find the steady state values for V_{out}, the voltage across and current into the capacitor, and the current through the output resistor for
   a. V_s=10VDC
   b. V_s=-10VDC

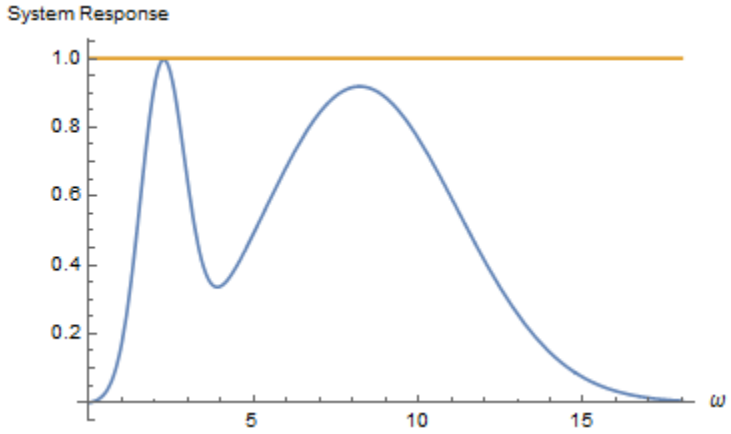


3. What is the key difference between a standard pn junction diode and a Zener diode? Describe an experiment you could do to distinguish between two unlabeled diodes.
4. Problem 3.18
5. What kind of transistor is in the circuit, why is the diode in the circuit important?



6. Which of the following is explicitly a fourier series? For those that are not explain why they are not.
   a. $F(t) = t^2$
   b. $F(t) = 1 + \cos(1.8\,t)$
   c. $F(t) = 1 + \cos(1.8\,t) + \cos(\sqrt{2}\,t)$
   d. $F(t) = 3 + \cos(1.8\,t) + \sin(3.6\,t)$

7. Determine the cut-off frequencies for the system response curve.



8. Which of the following systems can experience ring down due to a step function input?
    a. A 0^{th} order system
    b. A 1^{st} order system
    c. A 2^{nd} order system
9. What is the difference between an overdamped and underdamped LRC circuit with a sinusoidal input?