***EE315 DESIGN Problem* – (worth 15 points) Fall 2019, Dr. B**

**DUE DATE: Thursday, Nov. 21, 2019.**

***HINT: I expect no two designs to be substantially alike. If so, there must be collusion (or conspiracy) among engineers employed by the various competing companies. Ethics violation -big time.***

**Refer to Figure 4.22 page 208, in textbook.**

**My needs as a potential customer:** I have an amplifier system that for my purposes, needs a Power Supply to drive it. For your power supply design purposes, my amplifier system can be modelled as a simple load resistor of 2500 ohms. (i.e. the power supply output drives a load resistor of 2500 ohms). This project can be assumed to be a competitive design process among all potential vendors (that is--YOU!!)

**So, there are two parts to your submitted Proposal: a technical design part AND a component cost part. I expect a complete design that meets all my technical requirements along with a parts listing and individual parts cost for your design proposal. As part of your component costs; all components must be purchased from only USA sources and NEW but you can forget taxes and shipping costs in your cost proposal.**

**YOUR DESIGN TASKS:**

* **Requirements--- DESIGN a FULL WAVE BRIDGE RECTIFIER Power Supply circuit that will:**
  + Take 120volts ac, 60 hz, sinusoidal waveform from the wall power and convert it to a “regulated” dc value giving 15 volts +, - 1.0 volts across a 2500 ohm output load resistor with no more than 2% ripple voltage, **all at a total component parts cost of less than $175.00 (US$).**

Your design process/ analysis is to be conducted **by hand and by Multi-Sim of your design**.

* + Consider for this design task:
    - Assume an ideal transformer and ideal diodes. As part of your design process you must consider:
    1. A filter capacitor sized per the textbook equation/Lecture material that will meet the ripple voltage requirement above. See Equations 4.28 through 4.29(b) on page 216.
    2. A turns ratio for your power transformer.
    3. An ideal Zener diode within a shunt regular circuit arrangement as shown in Figure 4.21 page 205.
    4. Your design should be mindful of health and safety concerns for users and the general public with protections for its use. **Describe how your design will do that. Reference link below.**
    5. ALSO- I want an ON/OFF switch AND proper fusing of the power supply on input side (house power) and load side (i.e. current to the load). SO, don’t forget fusing requirements, which are:
       1. I also want fuse protection for 14 milliamps MAXIMUM going to my load resistor (AMPLIFIER INPUT RESISTANCE OF 2500 OHMS). So, add in costs for the fuses. Don’t forget the fuse holders either.
    6. **YOUR SUCCESS WILL BE GRADED upon how close you come to satisfying ALL MY stated requirements listed above.**

**A link for a typical parts catalog to use for estimating costs of your design is given below BUT YOU ARE NOT LIMITED TO USING IT.YOU MAY GET A BETTER DEAL FROM ANOTHER PARTS SUPPLIER BUT YOU NEED TO QUOTE YOUR PARTS SOURCE, WITH ONLY SINGLE ITEM QUANTITY COST. Give me quotes from your catalog(s) (WITH GOOGLE LINK) with page number, part number, quantity cost of a single unit (that is you don’t buy in bulk quantity.**

**[[1]](#endnote-1)**<https://www.alliedelec.com/?&&mkwid=sxZT1V5iD&pcrid=69877844779&pkw=electronic%20component%20supplier&pmt=b&gclid=EAIaIQobChMI2Pq3tKDa4AIVl7XACh0U7w1gEAAYASAAEgLaGvD_BwE&gclsrc=aw.ds>

http://www.blog4safety.com/2017/02/safety-precautions-to-take-when-working-with-electronic-equipment/

**GRADE SCALE: 15** points to THE student meeting ALL requirements AT the LOWEST PRICE among ALL other vendors (students)---this is “real world. This is a design problem so the “odds” of a tie situation among or between students are pretty dismal.

12 points to those students meeting all requirements while staying below $175.00 total parts costs. (this is **not** real world- if real world and you were not the winner, you get 0).

10 points if you meet 75% of all the performance requirements and staying under cost requirement.

If under 75% requirements met, 0 points after that.

If, in my judgement, it looks as if your proposed design has significant potential to blow up my precious Amplifier (simulated by the 2500-ohm load) or electrocute me when I turn it on, whenever I turn it on- that gets a 0 too.

Your proposal format: (**Only this format accepted; 0 otherwise). Just as in real world, you have to comply with customer proposal format requirements. Get used to it!**

* + **Title page**
  + **First page: Purpose of your Design. Statement of all technical requirements as you understand them.**
  + **After first page; As many pages as necessary for your circuit design process/ computations/power supply schematic diagram.**
  + **Additional pages as needed to show results of your “design by hand computation” followed by your Multi-Sim simulation. I will examine your hand computations and compare with your Multi-Sim results. The two results should align within about 5%.**
  + **Next to last page: A paragraph or two stating how your design and considerations involved in your design complies with health/safety concerns via blog/safety link above.**
  + **Last page(s): construct Table of cost data showing detailed in EE315-- parts/component costs and catalog source-- (give me a link), component part number, page number in catalog, part cost. I want my company cost data analysts to be able, if they want, to confirm the total component cost from your Design proposal. (real world)**
  + **I prefer a word-processed document but a neatly hand-written document is OK.**
  + ***This project is to fulfill newly revised ABET procedures for new, more real world realistic, outcomes in EE315- “an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global,cultural,social,environmental, and economic factors”.***

1. ***Special notes:***

   **Collaboration between/among EE315 students in learning to use Multi-Sim is legal. However, the design and technical/cost proposal MUST BE YOUR OWN WORK! I expect to find no two designs substantially alike!**

   **As in any competitive proposal evaluation process, any questions asked by potential bidders(you) where I provide you an answer to your question will be shared among all competitors. So, be careful what you ask!**

   **Don’t wait until evening of 20 Nov,2019 to begin your design work and write your proposal!** [↑](#endnote-ref-1)