Questions and Answers

ECE 2300 – February 5, 2015 – Dr. Dave Shattuck

Comment (C): Solve more problems on devices.

Reply (R): We have a large amount of material to handle in this course. We will finish the device problem we started, but if you want to see more problems, you will either need to come to my office, or raise a problem during the optional problem sessions.

Question (Q): What is an example of a complex set of functions that my calculator needs to be able to solve?

Answer (A): Actually, what I said was that your calculator should be able to solve a set of complex equations. Here is an example that comes from the lecture notes later this semester:

The two variables here, ***V****a,m* and ***I***x,m, are complex quantities. Thus, we have two complex equations in two complex unknowns. A good calculator will solve these simultaneous equations for you.

Q: Do we have to write subscripts in Caps all the time?

A: You should, but we do not deduct credit if you do not.

Q: Are your lectures given at the same pace as the reading assignments?

A: They are intended to be. Sometimes the lectures fall behind the reading assignments. I am working on this issue, and will continue to work on it.

Q: Should we expect the exam questions to be tricky in terms of vocabulary?

A: The short answer is, yes. I would prefer to use the wording as follows: the exams will require that you understand the concepts and the vocabulary so well that you can handle problems that require this understanding to be able to do them. Students usually use the term “tricky” for such problems. I am unlikely to be able to get them to change their terminology.

Q: How do I study this and understand it easily?

A: I do not know. If I did know, I would tell you how. I believe that this material is difficult, and you will have to work hard to understand it. I do not know any shortcuts or easier ways.

Q: In the device problem you worked, why is the current source *iD* pointing upward and not down? Is there a specific way we need to draw devices when it is a current source in parallel with a resistance?

A: Having that current source pointing upward was an arbitrary choice that I made. There is no specific way that it should be drawn. If I had chosen it pointing downward, it would simply mean that my solution for *iD* would have the opposite sign from the solution I will get with the choice I made.

Q: How does “electrons gaining/losing energy” relate to the power calculations?

A: If a device absorbs positive power, then the charge carriers in that device must be losing energy when they go through that device. If a device delivers positive power, then the charge carriers must be gaining energy when they go through that device.

Q: When you have a model of a device, and it isn’t connected to anything, how are you to solve the questions they ask you?

A: Really, you cannot find the model of device unless you make some measurements on it, which means connecting it to something. In the problem we worked in class, we did not draw the things that had been connected to the device, but it is assumed that they must have been connected at some point.

Q: What is the best way to study for the exams besides doing old exams?

A: I suggest the following:

Read the textbook.

Attend class, pay attention, and ask questions when appropriate.

Read the lecture notes carefully, and discuss them with your classmates.

Do the homework alone.

Do the homework with others, explaining the difficult concepts to each other.

Go to visit the instructors to discuss the concepts that are not clear to you.

Do the old exams under a strict time limit, with real rewards and penalties, that simulate the kind of pressure that you will feel during the actual examinations.

Those are my suggestions.

Q: In Problem #3 in class today, the KCL for C.S. #1, I did not understand how you chose that node, and how is it this big?

A: First of all, the Closed Surface #1 is not a node. I chose it so that I would get a useful and simple equation. This ability to make good choices comes with practice. The closed surface can be as big or as small as you wish. There is no limit.

Q: In the device problem, *vT/RT*, the sign depends on the way I draw the current through *RT*, or it has nothing to do with that?

A: It has nothing to do with how you draw an arrow. Ohm’s law tells us the polarity for the current *vT/RT*.

Q: Can I give NASA $140 million in the form of IOU’s from the U.S. Treasury.

A: Sure. Good luck with that. I suggest that instead, you show units.

Q: Is it OK that we answer questions in class if we already took this class?

A: You should use your best judgment. I ask questions in class to get everyone to think. If you answer the question quickly because you heard the question before, you are short-circuiting the class benefit of everyone thinking about the answer. Again, use discretion.

Q: In my 6th grade Algebra class, the teacher would us that *vY/iY* is bad if *iY* = 0. How is it OK here?

A: I would prefer the terminology: “Division by zero is not defined”. And, we are going to be doing a lot of approximating, which means that sometimes we are not actually dividing by zero. I need you to understand what the rule above means, so that you know where it has meaning and where it does not. If you plot *vY/iY* for a 10[Ohm] resistor, on axes of *vY* vs *iY*, you get a straight line that goes through the origin. Is that plot meaningless at the origin? In this context, I think the answer is no. It does have meaning here, it is simply a spot on this line where the voltage and current are both zero. Is this simple? No, it is not. It is difficult, and will take some practice to get correct.

Q: Will we have to be able to identify active and passive sign convention by name?

A: Yes, I want you to be able to do this, if asked.

C: In class today, it was unclear in the problem statement whether you were looking for us to fill in a missing space in front of the ratio *vT/RT*, or if you were asking us to work with information given, assuming it was absolute and complete.

R: I believe that you need to listen to or read carefully the questions you are asked, so that you do know what is being asked. In that discussion, we did have a KCL equation where the sign was in question. However, on a separate line, I asked, “What is the direction of this current?” You need to be able to keep different questions separate. The Ohm’s Law question I was asking needed to be answered, before we could answer the KCL question. It is important to be able to keep these things straight. I am not saying it is easy. I am saying that it is important.

Q: Do the sign conventions concerning Ohm’s Law apply to power being absorbed or delivered? If so, which signs would be assigned to absorbance and deliverance?

A: Yes, we use the same two sign conventions, the passive sign convention and the active sign convention, to get the sign correct in Ohm’s Law, and to get the sign correct in power expressions. The ways to do these things are covered in the lecture notes.

Q: It seems like most students are having a hard time understanding simple concepts. (Not me of course… just kidding.) Is there a psychological explanation for this?

A: First, I do not think these are simple concepts. I am trying to change the way you are thinking about Ohm’s Law, KVL, and KCL. The hardest thing you can do is to change the way you think, in my opinion. I do not know if this is a psychological explanation or not. I am not surprised that students are having a hard time. This is hard.

Q: Why did it take us 20 minutes to decide Quiz #1?

A: Ouch. This is a good question. This is my fault. We cannot spend this much class time on such matters. I will need to find a way, outside of class, to work out these kinds of issues. Thank you for asking this question.

C: I am so confused, I do not even know what question to ask.

R: Fair enough, but you have to get beyond that stage. You need to figure out how to ask questions that will help you understand. No, this is not easy. It is hard.

Q: Is there anything against always using passive sign convention?

A: There is nothing against you choosing to use the passive sign convention to define the voltages and currents that you define. However, other people may have already assigned reference polarities in the active sign convention. When they do, you need to be able to write equations in terms of those reference polarities, and get the signs correct. So, the bottom line is, you do not always have a choice.

Q: How does a reference polarity (one arbitrarily defined) differ from one defined by Ohm’s Law? If I wrote the current *vT/RT* upward, why can’t I just treat it as active in future calculations?

A: The polarity given by the current *vT/RT* in Ohm’s law is not arbitrary anymore, because *vT* was already defined. So, the current *vT/RT* is not an arbitrary reference polarity. The current is defined because the voltage was defined previously. You can pick reference polarities arbitrarily. However, once you do, then other things are determined, and cannot be picked anymore. The current *vT/RT* is going downward, and the current -*vT/RT* is going upward, because of Ohm’s Law and definition of *vT* that was already chosen.

Q: If we labeled *RT* as *–RT*, would current flow in the opposite direction, or can we not say *RT* is *–RT* instead?

A: Excellent question! The second rule you cite holds. We simply choose not to label resistances as *–RT*. It is a rule. We can label a resistance -6[Ohm], but not as *–RT*. That was in the definition we gave when we introduced resistances.