

# 1CS20 QUIZ 2

**Full Name (Printed)** \_\_\_\_\_

**Full Name (Signature)** \_\_\_\_\_

**Student ID Number** \_\_\_\_\_

- The exam is open-book and open notes. You will probably do better to limit yourself to a single page of notes you prepared well in advance.
- **All work must be your own.** You are not allowed to collaborate with anyone else, you are not allowed to discuss the exam with anyone until all the exams have been submitted (after the close of the submissions window for the exam).
- You have 30 minutes to complete the exam and sufficient time to scan the exam and upload it to GradeScope. The exam *must* be uploaded to GradeScope within the time allotted (that is, by the end of the lecture hour). We will only accept submissions through GradeScope and will not accept any exam submitted after the submission window closes (CAE students must contact Corbin for instructions).
- **Given the limits of GradeScope, you must fit your work for each part into the space provided.** You may work on scratch paper, but you will not be able to upload the work you do on scratch paper, so it is essential that you copy your complete solution onto the exam form for final submission. We can only consider the work you submit on your exam form.
- **For full credit the grader must be able to follow your solution from first principles to your final answer. *There is a valid penalty for confusing the grader.***
- It is **YOUR** responsibility to make sure the exam is scanned correctly and uploaded before the end of the submission window. The graders may refuse to grade pages that are significantly blurred, solutions to problems that are not written in the correct place, pages submitted in landscape mode and/or work that is otherwise illegible - if any of this occurs, you may not receive *any* credit for the affected parts.
- Focus on the concepts involved in the problem, the tools to be used, and the set-up. If you get these right, all that's left is algebra.
- **Have Fun!**

The following must be signed before you submit your exam:

By my signature below, I hereby certify that all of the work on this exam was my own, that I did not collaborate with anyone else, nor did I discuss the exam with anyone while I was taking it.

**Signature** \_\_\_\_\_

A long, straight wire carries a current  $I(t)$ ...

- 2a) (5 points) *Derive* the magnetic field (vector) at some point a distance  $r$  from the wire. Explain how you obtained the direction of that vector. ~

- 2b) (10 points) Under what conditions will that wire give rise to an electric field? Assume these conditions are met and use symmetry (as I did in class) to obtain a mathematical description of the electric field so generated. The more correct detail you provide, the more points you will receive. Do a quick, qualitative plot of the electric field for points near the wire.

- 2c) (10 points) Show that in the region right around the wire, the electric field varies logarithmically with distance from the wire. What direction will the electric field point near the wire if the current is increasing in time?

- 2d) (5 points) Assuming you've done everything correctly, there's still a problem with your solution. What is that problem? With the time that remains (remember, you only get 30 minutes to take the quiz!) discuss a possible shortcoming in your approach and/or a way to address the problem.