Name:	Signature:
Surname:	Student ID Number:

PHYS 102 General Physics II – Midterm 2

April 25, 2018 19:30 -21:00

Please read!

- Count to make sure that there are 5 pages in the question booklet
- Check your name and surname on front page, and student ID number on each page, and sign each page.
- This examination is conducted with closed books and notes.
- Put all your personal belongings underneath your seat and make sure that pages of books or notebooks are not open.
- Absolutely no talking or exchanging anything (like rulers, erasers) during the exam.
- You must show all your work to get credit; you will not be given any points unless you show the details of your work (this applies even if your final answer is correct!).
- Write neatly and clearly; unreadable answers will not be given any credit.
- If you need more writing space, use the backs of the question pages and put down the appropriate pointer marks.
- Make sure that you include units in your results.
- Make sure that you label the axis and have units in your plots.
- You are not allowed to use calculators during this exam.
- Only the answers in the boxes will be graded and NO partial credit will be given. No points will be given to unjustified answers. Incomplete calculations will not be graded

P102_Index:

1	2	3	4	TOTAL

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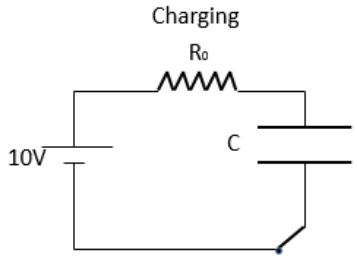
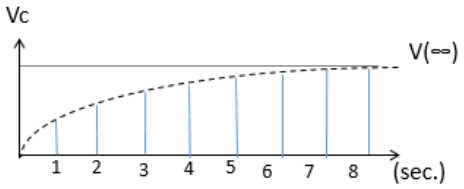
1-(25 Pts.) As shown in the figure, a simple RC circuit is powered by a **10 V** battery. A capacitor (**C=2F**) is initially **uncharged**. During charging, the recorded voltage across the capacitor is given below. (e^{-1}=0.367, e^{-2}=0.135, e^{-3}=0.049, e^{-4}=0.018, e^{-5}=0.006, ln2=0.7, ln3=1.1).





time (sec)	Vc (Volt)
0	0
1	6.33
2	8.65
3	9.51
4	9.82
5	9.94

a) Calculate the time constant of the RC circuit.

τ=

b) Calculate the half life of the capacitor. (the time to reach half of the maximum voltage across the capacitor)

$T_{1/2}$=

c) Calculate the electrical power dissipated in the resistor.

P(t)=

d) Calculate the total electrical energy dissipated in the resistor.

E=

Solution continues on the back side of the page **Yes** □ **No** □

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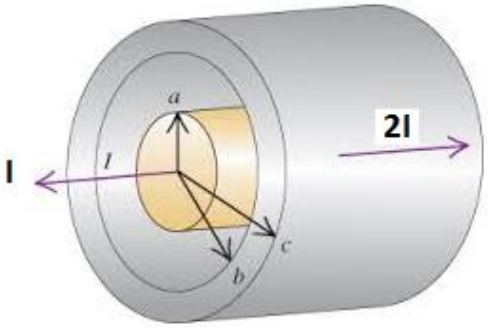
2-(25 pts) As shown in the figure, an infinetely long cylindric solid conductor with radius a, is supported by a cylindrical conducting tube with inner radius b and outer radius c. Central conductor carries current **I** but the tube conductor carries **2I** in the opposite direction. The currents are distributed uniformly. Calculate the magnitude of the magnetic fields for;



a) r< a

B=

b) a<r<b

B=

c) b<r<c

B=

d) r>c

B=

Solution continues on the back side of the page **Yes** □ **No** □

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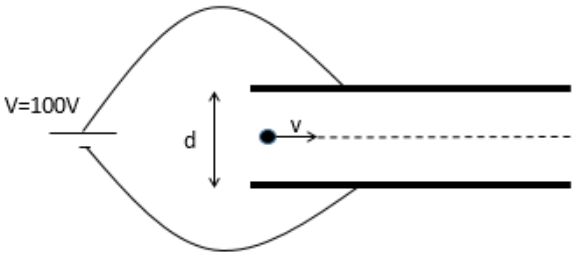
3- (25 pts) As shown in the figure, a positively charged particle (q_0, mass m_0) is moving with a velocity V_0 in the presence of both an **electric field** and a **magnetic field**. Electric field is generated by very large parallel plates. The potential difference between the two plates is 100V. The particle is following a **straight trajectory**. Calculate the magnitude and the direction of the magnetic field between the plates. (Ignore gravitational interactions).



B=

Solution continues on the back side of the page **Yes** □ **No** □

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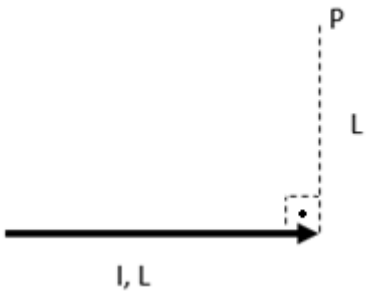
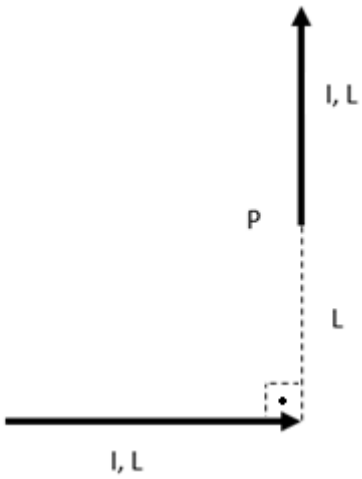
4- (25 pts)

a) Calculate **the magnitude** and the **direction of** the magnetic field generated by a straight current (I) -carrying wire of length **L** at point **P**.



B=

b) As shown in the figure, the second identical current (I) -carrying wire is placed above the first wire. Calculate **magnitude and direction** of the **magnetic force** between the two wires. (Do not try to calculate the integral, clearly identify the boundaries).



F=

Solution continues on the back side of the page **Yes** □ **No** □