

## **Physics 10164 - Exam 2B**

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work even if you get the right answer. Clearly indicate your answer with a circle or a box and remember to include correct units and significant figures.

1. (40 pts) A circuit contains a 12 Volt battery, a switch, a resistor, and a  $3.0\ \mu\text{F}$  capacitor. When the switch is closed, the initially uncharged capacitor begins to charge up. After 2.2 milliseconds, the voltage drop across the resistor is equal to the voltage drop across the capacitor.
  - a) What is the resistance of the resistor?
  - b) At what time is the capacitor 95% charged?

2. (30 pts) Wire A passes through the origin and carries a current of 7.0 Amps. Wire B passes through the x-axis at  $x = 1.2$  meters and carries a current of 3.0 Amps.

- a) What is the magnitude and direction of the magnetic field at the coordinate  $x = 45$  cm?
- b) At what x-coordinate (other than infinity) is the total magnetic field due to the two wires equal to zero?

A  


B  


#3. (30 pts) A single-turn square wire loop 25 cm on a side carries a clockwise current of 2.2 Amps. The square is immersed in a uniform 6.0 Tesla magnetic field in the plane of the page pointing in the  $+x$  direction as shown.

- a) Determine the magnitude and direction of the magnetic force on each of the four straight wire segments of the loop.
- b) What is the magnitude of the magnetic torque acting on the loop?

