Physics 10164 - Exam 3D

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. <u>Clearly indicate your answer with a circle or a box</u> and remember to include correct <u>units</u> and <u>significant figures</u>.

1. (35 pts) A single-turn square loop 12 cm on a side is suspended inside a solenoid so that the plane of the loop is perpendicular to the axis of a larger solenoid. The solenoid has 500 turns and is 24 cm long. An end-on view of the situation is shown below.

As the current in the solenoid drops from 4.0 Amps (clockwise) to zero in 0.25 seconds, determine (a) the magnitude of the induced EMF in the square loop and (b) the direction of the induced current in the square loop.



2. (35 pts) An alternating current RC circuit contains a 2.2 Ohm resistor, a 150 μF capacitor, a 120 Volt (rms) voltage source, and it is driven at a frequency of 75 Hz.

- a) What is the rms current in this circuit?
- b) What is the maximum current in this circuit?
- C) When the current is equal to zero, what is the voltage drop across (i) the resistor, (ii) the capacitor and (iii) the power source? Explain or show your work for each answer.

3. (30 pts) Light enters a triangular prism through the left face as shown below. The light hits the longest side of the prism at the critical angle and so undergoes total internal reflection.

a) What is the initial angle of incidence with which light enters the prism? The index of refraction of the prism is 1.47 and it is surrounded by air.

b) With what angle of refraction does the light leave the prism through the bottom face?

