

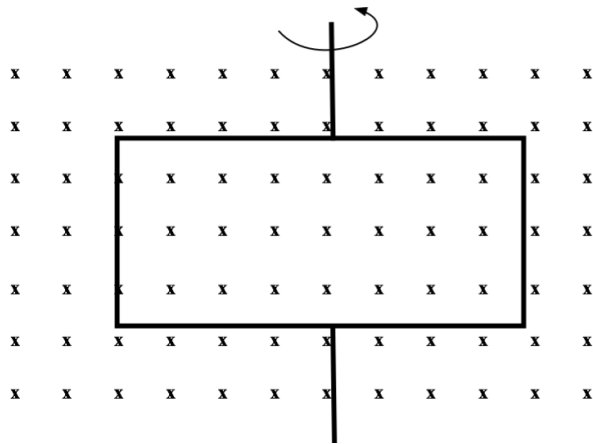
Physics 10164 - Exam 3A

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. (30 pts) An alternating-current RLC circuit has a 1.5 Ohm resistor, a 75 mH inductor, an unknown capacitor and a 120 Volt (rms) power source. The resonant frequency of the circuit is measured to be 53 Hz.
 - a) What is the capacitance of the capacitor?
 - b) What is the rms current at the resonant frequency?
 - c) If the inductance is increased to 95 mH and the circuit operated still at 53 Hz, what is the new current?

2. (40 pts) A rectangular 25-turn wire loop is shown below. The loop measures 12 cm x 22 cm. The loop starts rotating through an external 7.7 T magnetic field. Initially, the external field is perpendicular to the plane of the loop. The loop rotates 90 degrees in a 0.20 second time interval.

- Find the magnitude of the average induced EMF in the loop during the 0.20 sec time interval.
- Find the direction of the induced current in the loop (be sure to show your work, explain each step in your logic).
- The induced EMF in the loop is not constant over the 0.20 sec time interval (what you calculated in part a was an average). At which time is it larger, $t = 0$ or $t = 0.20$ s? Justify your answer.



3. (30 pts) An object is placed 17 cm in front of a diverging lens of focal length -25 cm. There is an unknown lens behind the diverging lens, 30 cm away. The final image for the system appears halfway in between the two lenses.

- a) What is the focal length of the 2nd lens?
- b) What is the total magnification of the final image?