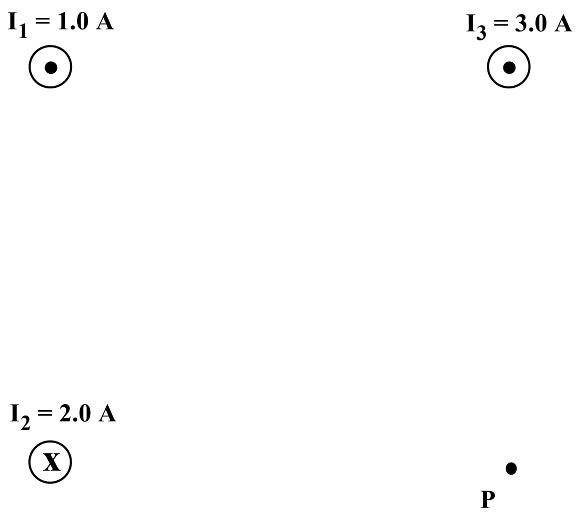
Physics 10164 - Summer 2016 - Exam 2

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.

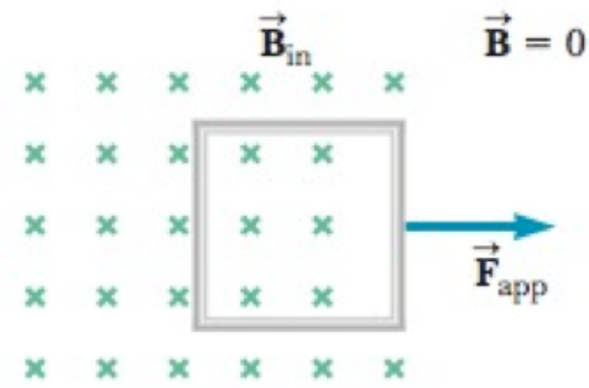
#1. (35 pts) Three current-carrying wires are perpendicular to the plane of the page as shown below. They are arranged at three corners of a square that is 25 cm on a side. What is the net magnetic field (both magnitude and direction) due to these wires at point P, in the lower right corner of the square?



#2. (35 pts) A single turn square coil, 12 cm on a side has a resistance of 0.15 Ω. It is being pulled with a constant speed of 0.16 m/s in the +x direction in the presence of a uniform magnetic field of 350 T acting perpendicular to the loop as shown below.

At t = 0, the loop is completely inside the field and the right edge is at the edge of the field. At t = 2.2 seconds, the loop is completely outside of the field.

(a) What is the magnitude of the induced EMF in the loop during the 2.2 second time interval?
(b) What is the direction of the induced current in the loop?
(c) What is the magnitude of the applied force necessary to pull the loop out of the field with constant velocity (assume the right side of the loop has already exited the field)?



#3. (30 pts) In a series circuit, a generator (120 Hz, rms voltage of 60.0 V) is connected to a 12.0-Ω resistor, a 4.10-μF capacitor, and a 53-mH inductor.

(a) Find the rms current in this circuit.
(b) Find the rms voltage difference across each circuit element.
(c) What is the resonant frequency of this circuit?
(d) What is the rms current at resonant frequency?