PHYS 114 - Sixth Homework

1. Explain in your own words the following concepts (do not use equaitions and do not copy the explaination in the book):

    Motional emf

    Induced Electric Field

    Inductance

    Self Inductance

2. Consider 2 inductors with self inductances L_1 and L_2 respectively. The two inductances are shielded magnetically and hence they do not produce magnetic fluxes int he other one. What is the self inductance of the system if these two inductances are connected in parallel? or in series?

3. A circular coil of insulated wire has a radius of 9.0 cm and contains 60 turns of wire. The ends of the wire are connected in series with a 15 Ω resistor closing the circuit. The normal of the loop is initially parallel to a constant magnetic field of 5.0×10^{-2} T. f the loop is flipped over, so that the direction of the normal is reversed, a pulse of current will flow through the resistor. What amount of charge will flow through the resistor? Assume that the resistance of the wire is negligible compared with that of the resistor. (H. C. Ohanian, "Physics", Ch. 32, Pr. 19)

4. A transmission line consists of two concentric tubes of thin copper sheet metal with radii R_1 and R_2. The current flows to the left along one of the tubes and back along the other, copleting the circle; The current is uniformly distributed over the surface of each tube. Show that the self inductance per unit length of this transmission line is:

$$\frac{\mu_0}{3\pi} \ln \frac{R_2}{R_1}$$

(H.C. Ohanian, "Physics", Ch. 32, Pr. 47)

5. Figure 33.13 (in H.C. Ohanian "Physics" pg. 818) shows a mangetic solar motor, called the Presnyakov wheel. The wheel is made of a ferromagnetic material. A fixed permanent magnet is installed near the top, where sunlight strikes the wheel. The heat of the sunlight converts

the top portian of the ferromagnet temporarily into a paramagnet, with a much smaller value of permeability. Explain why this wheel keeps turning after it has been given an initial push.