PH202-1G
Spring 2014

Worksheet February 19

Lenz's law

Describe Lenz's law qualitatively. What information can be get from it?

Describe the three steps necessary to determine the polarity of an induced emf.

Electric generator

Describe the process by which an electric generator produces a current.

Give a mathematical expression for the emf induced in an electric generator as a function of the angle between the magnetic field and the normal to the area of the loop.

Give a mathematical expression for the emf induced in an electrical generator as a function of the angular speed.

What kind of current is produced by this method of generating electricity? Why?

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Problems

1. A rectangular loop of wire with a width of 4.0 cm and a length of 16 cm sits in a square region of uniform magnetic field. The magnetic field points into the page with a magnitude of 9 T. A force is applied to the shorter side of the wire such that it moves to the right with a constant speed of 0.73 m/s. Find the magnitude and direction of the induced emf when the loop a) is moving completely within the magnetic field and b) is moving out of the region containing the magnetic field.

2. A circular loop of wire with a radius of 10 cm and an internal resistance of 0.030 Ω sits in a uniform magnetic field and is rotated by a mechanical force. At time t = 0, an ammeter attached to the loop of wire detects no current. The current increases to a maximum value of 21 A at 2.5 ms and then reaches zero again at 5.0 ms. What are the frequency and angular speed of the rotation and the magnitude of the uniform magnetic field?