Homework Problem Set #10

(Due date: 2011/05/25)

The full score is 50 points.

1) Uniformly magnetized sphere.

1a) (5 points) Problem **P.6–26(a)** of the textbook.

1b) (5 points) Problem **P.6–26(b)** of the textbook.

1c) (10 points) Follow Problem **P.6–26** of the textbook, plot the magnitude of on-axis magnetic flux density normalized to that at the spherical center $\left|\frac{\vec{B}(0,0,z)}{\vec{B}(0,0,0)}\right|$, where $\vec{B} = \vec{B}(x,y,z)$ is shown in Cartesian coordinates..

2) (15 points) Problem **P.6–29(a-b)** of the textbook.

3a) (5 points) Find the typical magnitude B_{earth} of the earth's magnetic flux density $\vec{B}$ (in Tesla).

3b) (5 points) Consider a hollow solenoid (Fig. 11-2 of the lecture notes) made by copper wire of radius $a = 1$ mm. The solenoid has 5 turns per centimeter, and a circular cross-section of radius $b = 2$ cm. What is the current needed to flow along the wire to generate a magnetic field as strong as the earth's?

3c) (5 points) Follow Problem 3b, what is the corresponding ohmic power consumption?