

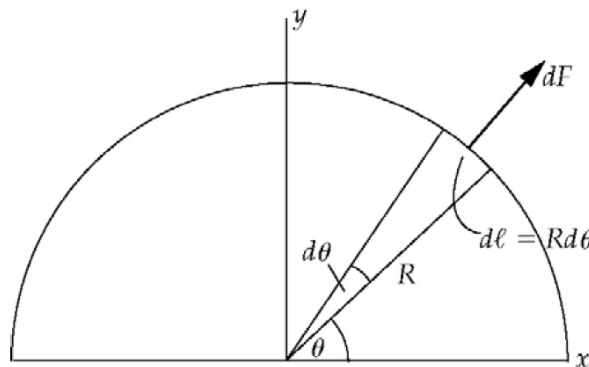
VE230 Assignment 3

Issue date: November 17th, 2017

Due date: November 22th, 2017

Pb#1(10%):

25 •• [SSM] A current-carrying wire is bent into a closed semicircular loop of radius R that lies in the xy plane (Figure 26-34). The wire is in a uniform magnetic field that is in the $+z$ direction, as shown. Verify that the force acting on the loop is zero.



Pb#2(20%):

28 • A 4.5-keV electron (an electron that has a kinetic energy equal to 4.5 keV) moves in a circular orbit that is perpendicular to a magnetic field of 0.325 T. (a) Find the radius of the orbit. (b) Find the frequency and period of the orbital motion.

Pb#3(20%):

29 •• A proton, a deuteron and an alpha particle in a region with a uniform magnetic field each follow circular paths that have the same radius. The deuteron has a charge that is equal to the charge a proton has, and an alpha particle has a charge that is equal to twice the charge a proton has. Assume that $m_\alpha = 2m_d = 4m_p$. Compare (a) their speeds, (b) their kinetic energies, and (c) the magnitudes of their angular momenta about the centers of the orbits.

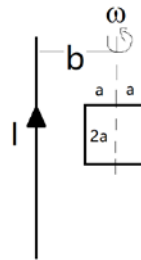
Pb#4(20%):

52 •• A rectangular current-carrying 50-turn coil, as shown in Figure 26-36, is pivoted about the z axis. (a) If the wires in the $z = 0$ plane make an angle $\theta = 37^\circ$ with the y axis, what angle does the magnetic moment of the coil make with the unit vector \hat{i} ? (b) Write an expression for \hat{n} in terms of the unit vectors \hat{i} and \hat{j} , where \hat{n} is a unit vector in the direction of the magnetic moment. (c) What is the magnetic moment of the coil? (d) Find the torque on the coil when there is a uniform magnetic field $\vec{B} = 1.5 \text{ T} \hat{j}$ in the region occupied by the coil. (e) Find the potential energy of the coil in this field. (The potential energy is zero when $\theta = 0$.)

The size of rectangular current-carrying coil is $48.0\text{cm} \times 48.0\text{cm}$. The current through the coil is 1.75A .

Pb#5(20%):

There is a square circuit near an infinite long conducting wire. It is rotating with its own center axis. Find the emf of the circuit according to the time



Pb#6(10%):

There is a particle with mass m and charge $q > 0$, it is moving toward right and keeping touch with upper surface. The magnetic field is B . If the initial speed is v_0 , how much work will the friction do? What is the range of v_0 ?

