SCS 139 Applied Physic II Semester 2/2011

Practice Questions for "Magnetic Forces and Fields (II)"

1. [HRW, 9E, P29.45] Each of the eight conductors in Figure 1 carries 2.0 A of current into or out of the page. Two paths are indicated for the line integral $\oint \vec{B} \cdot d\vec{s}$. What is the value of the integral for (a) path 1 and (b) path 2?

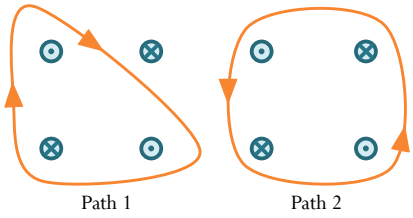

Figure 1: [HRW, 9E, Fig. 29-68]

   Ans: (a) $-2.5\ \mu T \cdot m$ (b) 0

2. [HRW, 9E, P29.50] A solenoid that is 95.0 cm long has a radius of 2.00 cm and a winding of 1200 turns; it carries a current of 3.60 A. Calculate the magnitude of the magnetic field inside the solenoid.
   Ans: 5.7 mT
3. [HRW, 9E, P29.51] A 200-turn solenoid having a length of 25 cm and a diameter of 10 cm carries a current of 0.29 A. Calculate the magnitude of the magnetic field $\vec{B}$ inside the solenoid.
   Ans: 2.9×10^{-4} T

Practice Questions for "Induction and Inductance"

4. [HRW, 9E, P30.7] In Figure 2: [HRW, 9E, Fig. 30-36], the magnetic flux through the loop increases according to the relation $\Phi_B = 6.0t^2 + 7.0t$, where Φ_B is in milliwebers and t is in seconds. (a) What is the magnitude of the emf induced in the loop when t = 2.0 s? (b) Is the direction of the current through R to the right or left?

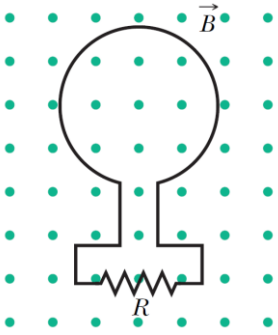

Figure 2: [HRW, 9E, Fig. 30-36]

   Ans: (a) 31 mV (b) to the left

5. A conducting loop with area 0.15 m^2 and resistance 6.0Ω lies in the x-y plane. A patially uniform magnetic field points in the +z direction. The field varies with time according to $B_z(t) = at^2 - b$ where a = 2.0 T/s^2 and b = 8.0 T. Find the magnitude of the loop current (a) when t = 3.0 s and (b) when B_z = 0 T.
   Ans: (a) 0.3 A (b) 0.2 A
6. The magnetic field inside a 20 cm diameter solenoid is increasing at the rate of 2.4 T/s. How many turns should a coil wrapped around the outside of the solenoid have in order that the emf induced in the coil is 15V.
   Ans: 199 turns
7. A circular wire loop 40 cm in diameter has 100Ω resistance and lies ina horizontal plane. A uniform magnetic field points vertically downward, and in 25 ms, it increases linearly from 5 mT to 55 mT. Find the magnetic flux through the loop at (a) the beginning and (b) the end of the 25 ms period. (s) What is the loop current during this time?
   Ans: (a) 6.28×10^{-4} Wb (b) 0.0069 Wb (c) 2.5 mA

Additional Questions for "Magnetic Forces and Fields (II)"

8. [HRW, 9E, P29.58a] Figure 3a shows a length of wire carrying a current i and bent into a circular coil of one turn. In Figure 3b the same length of wire has been bent to give a coil of two turns, each of half the original radius. (a) If B_a and B_b are the magnitudes of the magnetic fields at the centers of the two coils, what is the ratio B_b/B_a?

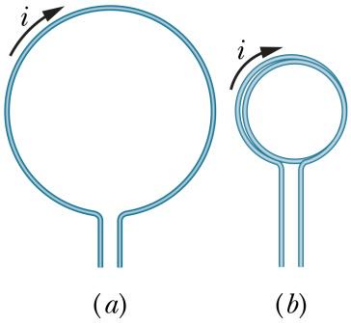

Figure 3: [HRW, 9E, Fig. 29-72]

Ans: 4

9. [HRW, 9E, P29.56] Figure 4 shows an arrangement known as a Helmholtz coil. It consists of two circular coaxial coils, each of 200 turns and radius R = 25.0 cm, separated by a distance $s = R$. The two coils carry equal currents i = 12.2 mA in the same direction. Find the magnitude of the net magnetic field at P, midway between the coils.

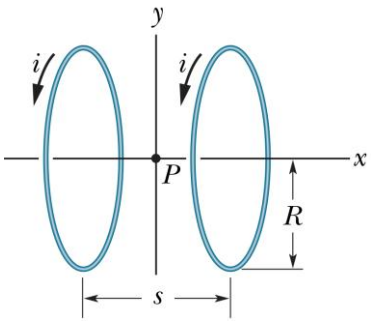

Figure 4: [HRW, 9E, Fig. 29-71]

Ans: 8.78 μT