SCS 139 Applied Physic II   Semester 2/2011

Practice Questions for "Alternating Current"

1. [HRW, 9E, P31.28] A 1.50 µF capacitor is connected as in Figure 1 to an ac generator with amplitude $\mathcal{E}_m = 30.0$ V. What is the amplitude of the resulting alternating current if the frequency of the emf is (a) 1.00 kHz and (b) 8.00 kHz?.
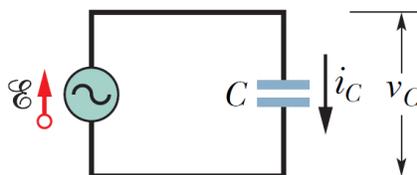
Figure 1: A capacitor is connected across an alternating-current generator. [HRW, 9E, Fig. 31-10]

Ans: (a) 0.283 A; (b) 2.262 A

2. [HRW, 9E, P31.29] A 50.0 mH inductor is connected as in Fig. 31-12 to an ac generator with amplitude $\mathcal{E}_m = 30.0$ V. What is the amplitude of the resulting alternating current if the frequency of the emf is (a) 1.00 kHz and (b) 8.00 kHz?.
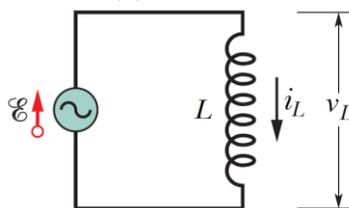
Figure 2: An inductor is connected across an alternating-current generator. [HRW, 9E, Fig. 31-12]

Ans: (a) 95 mA; (b) 12 mA

3. [HRW, 9E, P31.30] A 50.0 Ω resistor is connected as in Fig. 31-8 to an ac generator amplitude $\mathcal{E}_m = 30.0$ V. What is the amplitude of the resulting alternating current if the frequency of the emf is (a) 1.00 kHz and (b) 8.00 kHz?.
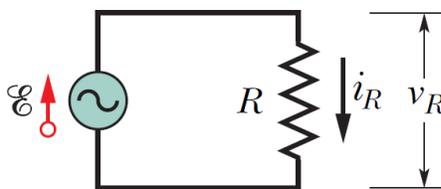
Figure 3: A resistor is connected across an alternating-current generator. [HRW, 9E, Fig. 31-8]

Ans: (a) 0.6 A; (b) 0.6 A

4. [HRW, 9E, P31.31] (a) At what frequency would a 6.0 mH inductor and a 10 µF capacitor have the same reactance? (b) What would the reactance be?

Ans: (a) 650 Hz; (b) 24.5 Ω

Practice Questions for "Maxwell Eqns and EM Wave"

5. [HRW, 9E, P32.1] The magnetic flux through each of five faces of a die (singular of "dice") is given by $\Phi_B = \pm N$ Wb, where N (= 1 to 5) is the number of spots on the face. The flux is positive (outward) for N even and negative (inward) for N odd. What is the flux through the sixth face of the die?
    Ans: +3 Wb

6. [HRW, 9E, P32.2] Figure 32-26 shows a closed surface. Along the flat top face, which has a radius of 2.0 cm, a perpendicular magnetic field $\vec{B}$ of magnitude 0.30 T is directed outward. Along the flat bottom face, a magnetic flux of 0.70 mWb is directed outward. What are the (a) magnitude and (b) direction (inward or outward) of the magnetic flux through the curved part of the surface?
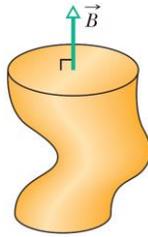
Figure 4: [HRW, 9E, Fig. 32-26]

    Ans: (a) 1.1 mWb; (b) inward

7. [HRW, 9E, P33.10] A plane electromagnetic wave has a maximum electric field magnitude of 3.20×10^{-4} V/m. Find the magnetic field amplitude.
    Ans: 1.07×10^{-12} T

8. [HRW, 9E, P33.11] A plane electromagnetic wave traveling in the positive direction of an x axis in vacuum has components $E_x = E_y = 0$ and $E_z = (2.0$ V/m$) \cos[(\pi \times 10^{15}$ s$^{-1})(t - x/c)]$. (a) What is the amplitude of the magnetic field component? (b) Parallel to which axis does the magnetic field oscillate? (c) When the electric field component is in the positive direction of the z axis at a certain point P, what is the direction of the magnetic field component there?
    Ans: (a) 6.7×10^{-9} T; (b) y; (c) -y