# SCS 139 Dr.Prapun: Problem Set 3

## Due date: Feb 22, 2013 (Friday)

1. [HRW, 9E, P29.52] A solenoid 1.30 m long and 2.60 cm in diameter carries a current of 18.0 A. The magnetic field inside the solenoid is 23.0 mT. Find the length of the wire forming the solenoid.

2. [HRW, 9E, P30.2] A certain elastic conducting material is stretched into a circular loop of 12.0 cm radius. It is placed with its plane perpendicular to a uniform 0.800 T magnetic field. When released, the radius of the loop starts to shrink at an instantaneous rate of 75.0 cm/s. What emf is induced in the loop at that instant?

3. [HRW, 9E, P30.4] A wire loop of radius 12 cm and resistance 8.5Ω is located in a uniform magnetic field $\vec{B}$ that changes in magnitude as given inFigure 1. The vertical axis scale is set by $B_s$ = 0.50 T, and the horizontal axis scale is set by $t_s$ = 6.00 s. The loop's plane is perpendicular to $\vec{B}$. What emf is induced in the loop during time intervals (a) 0 to 2.0 s, (b) 2.0 s to 4.0 s, and (c) 4.0 s to 6.0 s?

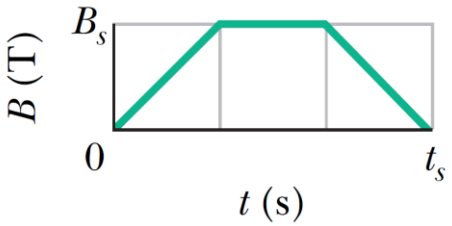


Figure 1: [HRW, 9E, Fig. 30-33]

**Assume that switch S has been open long enough to establish a steady current in the inductor**

4. [HRW, 9E, P30.54] In Figure 2, $\mathcal{E}$ = 100 V, $R_1$ = 10.0Ω, $R_2$ = 20.0Ω, $R_3$ = 30.0Ω, and $L$ = 2.00 H. Immediately after switch S is closed, what are (a) $i_1$ and (b) $i_2$? (Let currents in the indicated directions have positive values and currents in the opposite directions have negative values.) A long time later, what are (c) $i_1$ and (d) $i_2$? The switch is then reopened. Just then, what are (e) $i_1$ and (f) $i_2$? A long time later, what are (g) $i_1$ and (h) $i_2$?

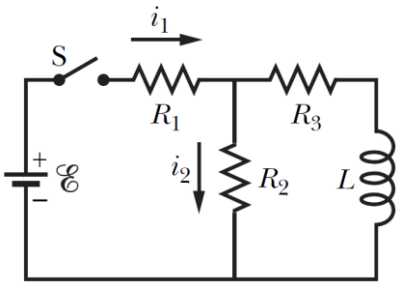


**Figure 2: [HRW, 9E, Fig. 30-60]**