

Physics 1214, Homework #6: solutions

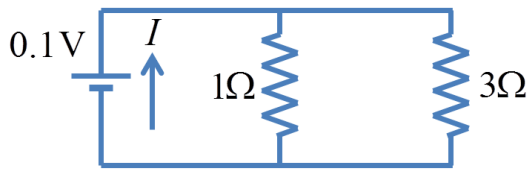
Answers to multiple choice questions: M1: B; M2: A.

P1:  $\mathcal{E} = \left| \frac{\Delta\Phi}{\Delta t} \right| = A \left| \frac{\Delta B}{\Delta t} \right|$

emf produced by inner and outer loops are  $\mathcal{E}_1 = \pi(0.1 \text{ m})^2(0.1 \text{ T/s}) = 3.14 \text{ mV}$  and  $\mathcal{E}_2 = \pi(0.2 \text{ m})^2(0.1 \text{ T/s}) = 12.57 \text{ mV}$ , respectively. In case (a)  $I = (\mathcal{E}_2 - \mathcal{E}_1)/R = 9.43 \text{ mA}$ , and in case (b)  $I = (\mathcal{E}_1 + \mathcal{E}_2)/R = 15.71 \text{ mA}$ .

P2: Rod pulled in magnetic field generates motional emf  $\mathcal{E} = vBL = (5 \text{ m/s})(0.2 \text{ T})(0.1 \text{ m}) = 0.1 \text{ V}$ .

$$R = \frac{1}{\frac{1}{1 \Omega} + \frac{1}{3 \Omega}} = 0.75 \Omega \quad I = \frac{\mathcal{E}}{R} = \frac{0.1 \text{ V}}{0.75 \Omega} = 0.133 \text{ A}$$



P3:  $\mathcal{E} = \omega AB \sin \omega t$      $\mathcal{E}_{max} = \omega AB$      $\omega = \frac{\mathcal{E}_{max}}{AB} = \frac{0.002 \text{ V}}{\pi(0.1 \text{ m})^2(0.05 \text{ T})} = 1.27 \text{ rad/s}$

P4:  $\mathcal{E}_{max} = B \left| \frac{\Delta A}{\Delta t} \right| = vBL = (10 \text{ m/s})(0.1 \text{ T})(0.01 \text{ m}) = 0.01 \text{ V}$

