

# PHYS 208 –FALL 2016 – All Sections

## Midterm Exam III

**Multiple Choice:** 1) A ; 2) C ; 3) A

**Problem 1:** a)  $\vec{F} = Q\vec{v} \times \vec{B}$ ;  $F = |Q|vB$  in +y direction, or  $\vec{F} = -QvB\hat{j}$

b)  $R = \frac{mv}{|Q|B}$ ;  $R=2\text{cm}$ ;  $x_p=0$ ; Placing point P on y-axis =full credit;  $y_p=5\text{cm}$ .

c) Center above A; semicircle inside the B-field; straight line out of the B-field.  $F_m$  is perpendicular on velocity and therefore produces a circular motion. Newton's 1<sup>st</sup> applies outside the magnetic field. Energy conservation applies.

**Problem 2:** a)  $i = \frac{BLv}{R}$ , clock-wise (CW)

b)  $F_m = v \frac{B^2 L^2}{R}$ , opposing to F

c)  $F_{net} = F - v \frac{B^2 L^2}{R}$ , in the direction of F

d)  $P = \frac{(BLv)^2}{R}$

**Problem 3:** a) i)  $I_1 = I_2 = \frac{V}{R_1 + R_2}$ ;  $I_L = 0$

ii)  $I_2 = I_L = \frac{V}{R_2}$ ;  $I_1 = 0$

iii)  $I_L = I_1 + I_2$ ;  $I_L = \frac{V}{R_2}$ ;  $I_1 = \frac{V}{R_1 + R_2}$ ;  $I_2 = \frac{R_1}{R_2} \frac{V}{R_1 + R_2}$

b)  $\tau = L \left( \frac{1}{R_1} + \frac{1}{R_2} \right)$ ;  $\tau = 200\mu\text{s}$