

HW 6 Key

part A

1. ———

$$2. B = \frac{\mu_0}{2R} I = \frac{1.26 \times 10^{-6}}{2 \times 0.05} \times 2000 = 0.252 \text{ (T)}$$

$$3. B = \mu_0 n I = 1.26 \times 10^{-6} \times 2000 \times 0.5 = 1.26 \times 10^{-3} \text{ (T)}$$

part B.

$$1. F = q \vec{v} \times \vec{B}, \quad F_{\max} = qvB$$

$$\Rightarrow 5.2 \times 10^{-12} \text{ N} = (1.6 \times 10^{-19} \text{ C} \times 300 \times 10^6 \text{ m/s}) B$$

$$\Rightarrow B = 10.8 \text{ (T)}$$

$$2. F = I \vec{\ell} \times \vec{B} = I \ell B \sin \theta$$

$$F_{\max} = I \ell B$$

$$\Rightarrow 4 = (10 \times 0.2) B$$

$$\Rightarrow B = 2 \text{ (T)}$$

~~$$3. \vec{\tau} = N \vec{\ell} \times \vec{B}$$~~

3.

$$3. \quad \tau = N \cdot I \vec{A} \cdot \vec{B} = NIAB \cos \theta$$

$$\tau_{\max} = NIAB$$

$$= 200 \times 1.25 \times (0.2)^2 \times 0.5$$

$$= 5 \text{ (N}\cdot\text{m)}$$