C. B.

Ch 23 Q4

$r = 0.300\,m$ $\quad A = \pi \cdot 0.300^2 = 0.28274\,m^2$

$N = 487$ (turns)

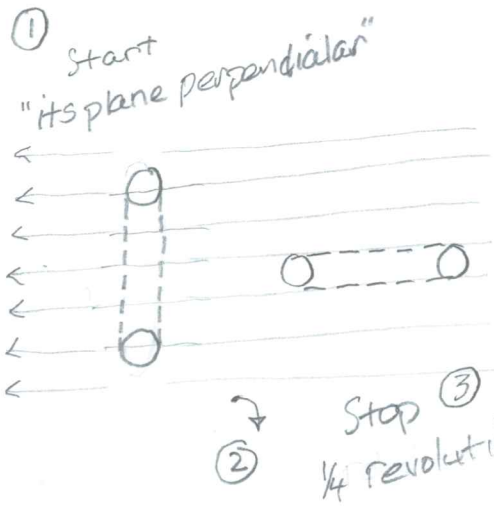
$\theta_f = 90°$ ($\frac{1}{4}$ revolution)

$t = 4.17\,ms$ (.00417s)

$\omega = 60\,revs = 120\pi\,rad/s$

$V_{avg} = 10{,}000$

$B = ?$



θ = angle between the normal to the coil and the field

Relevant relationships: $\Phi = B \cdot A \cdot \cos\theta$

$emf = N \cdot \Phi$

$emf_{avg} = N \cdot \frac{(\Phi_i - \Phi_f)}{\Delta t}$

where $\theta_i = 0°$, $\theta_f = 90°$

- $emf_{avg} = N \cdot B \cdot A \cdot \frac{(\cos\theta_i - \cos\theta_f)}{\Delta t}$ $= 9999.84$ ✓ (rounding error)

Solve for B

- $\frac{emf_{avg}}{N \cdot A} = B \cdot \frac{(\cos\theta_i - \cos\theta_f)}{\Delta t}$

plug into original formula to check

- $\frac{emf_{avg} \cdot \Delta t}{N \cdot A} = B \cdot (\cos\theta_i - \cos\theta_f)$

- $\frac{emf_{avg} \cdot \Delta t}{N \cdot A \cdot (\cos\theta_i - \cos\theta_f)} = B$ → substitute → $\frac{10000^{V} \cdot .00417^{s}}{487^{T} \cdot 0.28274\,m^2 \cdot 1} = 0.30284\,T$

$= \cos(0) - \cos(90)$

$= 1$