A toroid with rectangular cross section as shown has 1325 evenly spaced turns of wire. The wire carries a current of 1.75 A.

(a) \[ 10 \text{ pts.} \] Calculate the magnetic field inside the toroid at an arbitrary value of \( r \) for \( a < r < b \).

(b) \[ 10 \text{ pts.} \] Calculate the self-inductance of the toroid.

(c) \[ 10 \text{ pts.} \] Calculate the magnetic energy stored between \( r = 3.00 \text{ cm} \) and \( r = 3.50 \text{ cm} \) in the toroid. [This is shown as the cross-hatched region.]

\[
\begin{align*}
\oint B \cdot dl &= \mu_0 I_{enc} \quad B = \frac{\mu_0 NI_0}{2\pi r} \\
L &= \frac{N\Phi}{I_0} = \frac{\mu_0 N^2 h}{2\pi} \ln \left( \frac{b}{a} \right) = 1.35 \times 10^{-3} \text{ H} = 1.35 \text{ mH} \\
U &= \frac{\mu_0 N^2 I_0^2 h}{4\pi} \ln \left( \frac{r_2}{r_1} \right) = 9.12 \times 10^{-4} J
\end{align*}
\]