Exercise 16

Introduction to Electrodynamics

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Solution

Verified

Step 1

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Let the field of the outer solenoid point in the $+z$ direction, then the field of the inner one is in the opposite direction.

For $s < a$:

$$\vec{B} = \boxed{\mu_0 I(n_2 - n_1)\hat{\mathbf{z}}}$$

For $s \in [a, b]$, the field is only due to the outer solenoid:

$$\vec{B} = \boxed{\mu_0 I n_2 \hat{\mathbf{z}}}$$

, and outside $(s > b)$ is $\mathbf{zero}$.

Result

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$$\boxed{\vec{B} = \begin{cases} \mu_0 I(n_2 - n_1)\hat{\mathbf{z}} & , s < a \\ \mu_0 I n_2 \hat{\mathbf{z}} & , s \in [a, b] \\ 0 & , s > b \end{cases}}$$

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