

Example 17

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If the number of turns per unit length of a solenoid is doubled, keeping the other factors constant, how does the self inductance of the solenoid change?

Solution:-

$$L = \mu_0 n^2 A l, \text{ where } n = \text{no. of turns per unit length.}$$

If no. of turns per unit length is doubled

$$n_1 = 2n$$

$$\therefore L_1 = \mu_0 n_1^2 A l$$

$$\therefore L_1 = \mu_0 (2n)^2 A l = \mu_0 4n^2 A l$$

$$\therefore \frac{L_1}{L} = \frac{\cancel{\mu_0} 4 \cancel{n^2} A l}{\cancel{\mu_0} \cancel{n^2} A l} = 4$$

$$\therefore L_1 = 4L$$

\therefore Self inductance increases 4 times Ans.

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