

EE23BTECH11047 - Deepakreddy P

3 A 44 mH inductor is connected to 220 V, 50 Hz ac supply. Determine the rms value of the current in the circuit.

Solution:

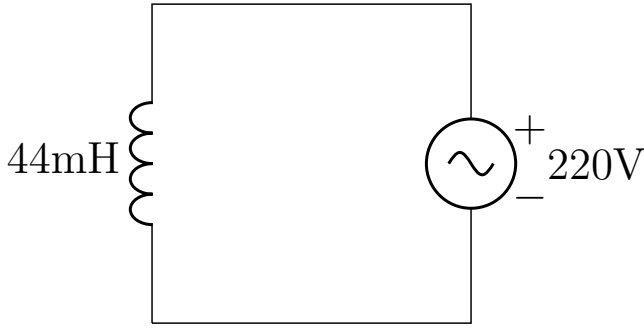


Fig. 1. Circuit-1

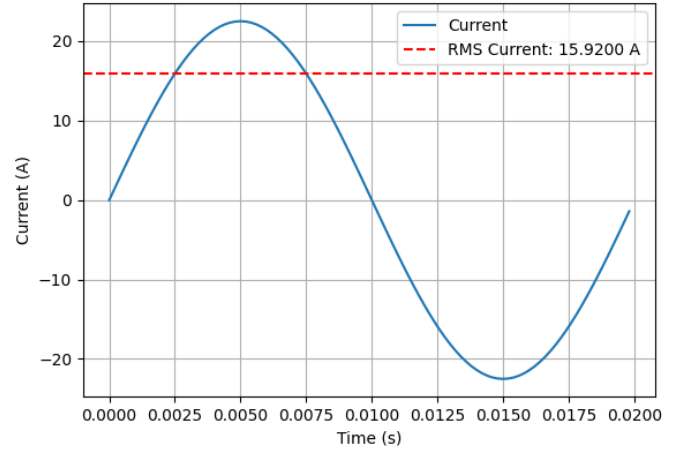


Fig. 3. Plot of I vs time

$$V = I(j\omega L) \quad (1)$$

$$I = \frac{V}{j\omega L} A \quad (2)$$

$$I = \frac{220 \sqrt{2}}{j(314)(44 \times 10^{-3})} A \quad (3)$$

$$I = \frac{22.52}{j} A \quad (4)$$

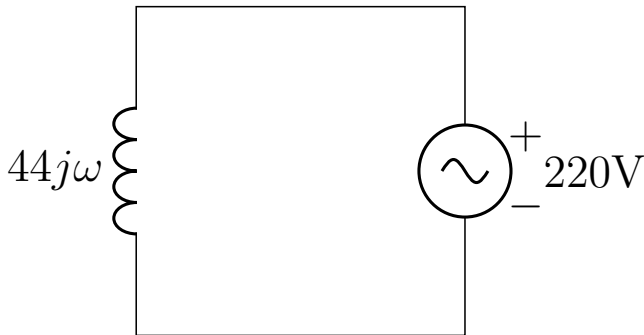


Fig. 2. Circuit-2

TABLE I
INPUT PARAMETERS

Symbol	Description	value
L	Inductor	44mH
V_{rms}	RMS Volt- age	220V
f	Frequency	50Hz

TABLE II
FORMULAE AND OUTPUT

Symbol	Description	Formulae	Value
X_L	Inductive Reactance	$2\pi fL$	13.816 Ω
ω	Angular Frequency	$2\pi f$	314 rad/sec
I_{rms}	Rms cur- rent	$\frac{V}{X_L}$	15.92A

$$I_{rms} = \frac{I}{\sqrt{2}} A \quad (5)$$

$$I_{rms} = \frac{15.92}{j} A \quad (6)$$

$$|I_{rms}| = 15.92 A \quad (7)$$