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:

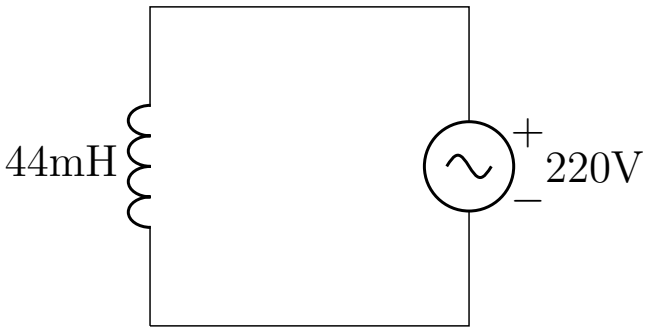

Fig. 1. Circuit-1

TABLE I
INPUT PARAMETERS

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

$$V = I\left(j\omega L\right) \tag{1}$$

$$I = \frac{V}{j\omega L} \tag{2}$$

$$I = \frac{220\sqrt{2}}{j\left(314\right)\left(44\text{x}10^{-3}\right)} \tag{3}$$

$$I = \frac{22.52}{j} \tag{4}$$

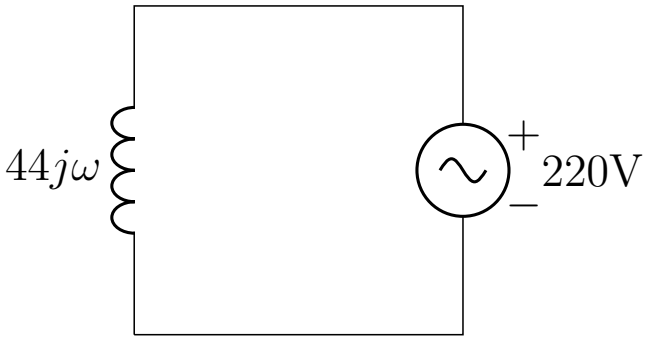

Fig. 2. Circuit-2

TABLE II
FORMULAE AND OUTPUT

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

$$I_{rms} = \frac{I}{\sqrt{2}} \tag{5}$$

$$I_{rms} = \frac{15.92}{j} \tag{6}$$

$$\left|I_{rms}\right| = 15.92A \tag{7}$$