In a series resonant LCR circuit, the voltage across R is 100 volts and $R = 1\,k\Omega$ with $C = 2\mu F$. The resonant frequency ω is $200\ rad/s$. At resonance the voltage across L is

A $2.5 \times 10^{-2} V$

B $40\ V$

C $250\ V$

D $4 \times 10^{-3} V$

5. In given series LCR circuit,

$V_{(across\ R)} = 100V$, $R = 1K\Omega = 1000\Omega$, $C = 2\mu F = 2 \times 10^{-6} F$

Resonant frequency $(\omega_0) = 200$ rad/s

Also, $\omega_0 = \frac{1}{\sqrt{LC}}$

$\Rightarrow 200 = \frac{1}{\sqrt{L \times 2 \times 10^{-6}}}$

$\Rightarrow L = \frac{100}{8} H$

Now, $V_{(across\ R)} = I_{rms} R$

$\Rightarrow 100 = (I)\,1000$

$\Rightarrow \boxed{I = 0.1A}$

$V_{(across\ L)} = I(X_L)$

$= (0.1)(\omega L)$

$= (0.1)(200)\left(\frac{100}{8}\right)$

$\boxed{V_{(across\ L)} = 250V}$