Name : Ananya Prasad

Reg No : 20BCE10093

1 $R = 10\Omega$, $L = 0.1H$, $C = 8mF$

$X_L = X_C$

$2\pi fL$; $f = \frac{1}{2\pi\sqrt{LC}} = \frac{1}{2\pi\sqrt{0.1 \times 8 \times 10^{-3}}} = 5.714 Hz$

$Q.f = \frac{I X_L}{I R} = \frac{2\pi fL}{R} = \frac{2\pi L}{R} \times \frac{1}{2\pi\sqrt{LC}} = \frac{1}{R}\sqrt{\frac{L}{C}}$

$Q f = \frac{1}{10}\sqrt{\frac{0.1}{8 \times 10^{-3}}} = 0.353$

$f_1 = f - \frac{R}{4\pi L} = 5.714 - \frac{10}{12.56 \times 0.1} = 5.714 - 7.961 = -2.25 Hz$

$f_2 = f + \frac{R}{4\pi L} = 5.714 + 7.961 = 13.67 Hz$

$f_2 - f_1 = 15.92 Hz$

2 $X_L = X_C$, $Z = R$

$$I_0 = I_m = \frac{V}{Z} = \frac{V}{R}$$

$$R = \frac{V}{I_m} = \frac{230}{1.5} = 153.3\,\Omega$$

$V_L = V_C = 600V$

$V_L = I_m X_L = 600V$

$$X_L = \frac{600}{1.5} = 400\,\Omega$$

now, $\frac{1}{2\pi f C} = 400$

$$C = \frac{1}{314 \times 400} = 7.96 \times 10^{-6} F$$

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3 $f = 50 = \frac{1}{2\pi\sqrt{LC}}$

$$LC = \frac{1}{(2\pi f)^2}$$

$$C = \frac{1}{(2\pi f)^2 L} = \frac{1}{(2 \times 3.14 \times 50)^2 \times 1 \times 10^{-3}}$$

$C = 0.01\ F$

$V = 5 \times 50 = 250V$ (as $Z = R$)

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4 $X_L = X_C$

$2\pi f L = \frac{1}{2\pi f C}$

$LC = \frac{1}{(2\pi f)^2}$

$L = \frac{1}{(6.28 \times 100)^2 \times (100 \times 10^{-3})} = \frac{1000}{6.28 \times 1000 \times 10 \times 100}$

$= 25.3\ H$

$=$

as $X_L = X_C$, Impedance $= R$.

$I_m = I_0 = \frac{V}{R} A$

$Z = \sqrt{R^2 + (X_L - X_C)^2}$

$I = \frac{V}{Z} = \frac{V}{\sqrt{R^2 + (X_L - X_C)^2}} = \frac{I_m}{2} = \frac{V}{2R}$

$I = \frac{I_m}{2}$

$\sqrt{R^2 + (X_L - X_C)^2} = 2R$

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$$(X_L - X_C)^2 = 3R^2$$

$$\sqrt{3}R = X_L - X_C$$

$$X_L = 2\pi f L = 628 \times 25.3 = 15888.4\ \Omega$$

$$X_C = \frac{1}{6.28 \times 200 \times 10^{-3}} = \frac{1000}{6.28 \times 200} = \frac{10}{12.56} = 0.796\ \Omega$$

$$R = \frac{X_L - X_C}{\sqrt{3}} = \frac{15888.4 - 0.796}{\sqrt{3}} = \frac{15887.6}{1.732} = 9172.97\ \Omega$$