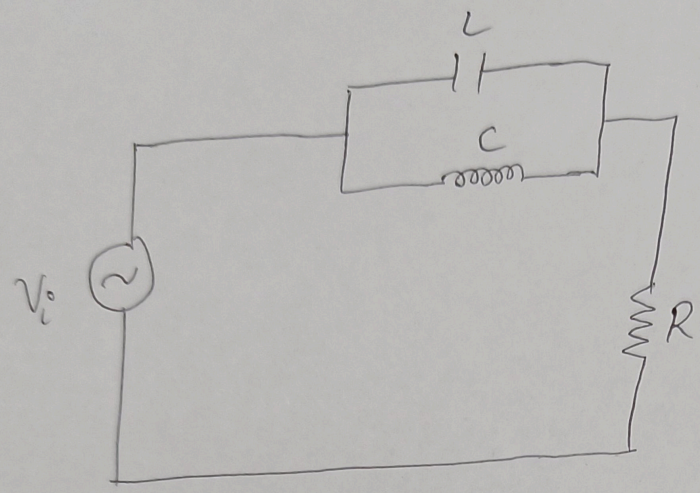
CSET102

Quiz - 4 Solutions

(1)



$R = 138\,\Omega$

$L = 4\,mH$

$C = 4\,\mu F$

$\omega = 1991$ rad/sec.

$$Z_{eq} = Z_R + (Z_L \,||\, Z_C)$$

$$Z_R = R = 138\,\Omega$$

$$Z_L = j\omega L = j \times 1991 \times 4 \times 10^{-3} = j7.964$$

$$Z_C = \frac{1}{j\omega C} = \frac{1}{j \times 1991 \times 4 \times 10^{-6}} = \frac{-j}{0.007964} = -j125.565$$

$$(Z_L \,||\, Z_C) = \frac{Z_L \times Z_C}{Z_L + Z_C} = \frac{j7.964 \times (-j125.565)}{j7.964 + (-j125.565)}$$

$$= \frac{999.999}{-j117.601}$$

$$Z_L \,||\, Z_C = j(8.5033)$$

$$Z_{eq} = 138 + j8.5033$$

Given $Z_{eq} = a + jb$

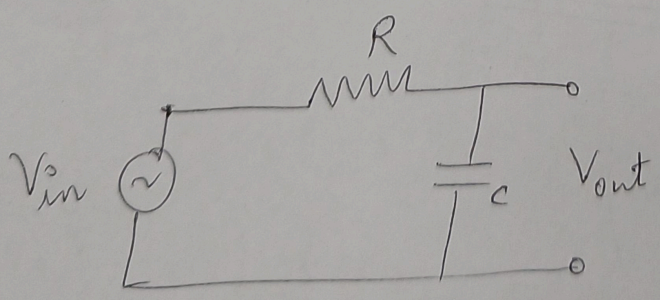
Comparing $a = 138$

$b = 8.5$

(2) $f_c = \frac{1}{2\pi RC}$

$= \frac{1}{2 \times 3.14 \times 30 \times 10^3 \times 81 \times 10^{-9}}$

$f_c = \frac{10^5}{2 \times 3.14 \times 3 \times 81} = 65.529 \text{ Hz}$



Given filter is LPF as o/p is taken across Capacitor

$$H(\omega) = \frac{Z_C}{Z_R + Z_C} = \frac{\frac{1}{j\omega C}}{R + \frac{1}{j\omega C}}$$

$$H(\omega) = \frac{1}{j\omega RC + 1}$$

$$|H(\omega)| = \frac{1}{\sqrt{1 + \omega^2 R^2 C^2}}$$

$\omega = 0, \ |H(\omega)| = 1$

$\omega = \infty, \ |H(\omega)| = 0$ } LPF