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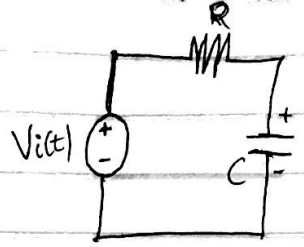

Soln

Converting to frequency domain.

$R = R$

$C = \frac{1}{j\omega C}$

$H(\omega) = \frac{V_2}{V_1}$

Using KVL (Series Connection).

$H(\omega) = \frac{V_0}{V_i} = \frac{\frac{1}{j\omega C}}{R + \frac{1}{j\omega C}} = \frac{\frac{1}{j\omega C}}{\frac{R j\omega C + 1}{j\omega C}}$

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

When $H(0) = 1$, $H(\infty) = 0$

The half power frequency which is equivalent to the Corner frequency on the BODE plot. but in the Context of filters is called Cut-off frequency.

ω_c is obtained by Setting magnitude of $H(\omega) = \frac{1}{\sqrt{2}}$

Substituting ω_c

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

$\frac{1^2}{1 + \omega_c^2 R^2 C^2} = \frac{1}{2}$

$2 \times 1^2 = 1 + \omega_c^2 R^2 C^2$

$2 = 1 + \omega_c^2 R^2 C^2$

$2 - 1 = \omega_c^2 R^2 C^2$

$1 = \omega_c^2 R^2 C^2$

Taking Square root of both Sides

$\sqrt{1} = \sqrt{\omega_c^2 R^2 C^2}$

$$1 = \omega_c RC$$

$$\omega_c = \frac{1}{RC}$$