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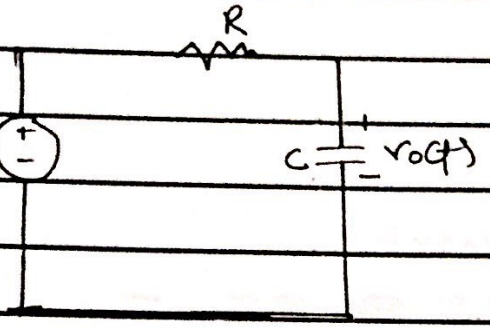
18/ENG04/028
Electrical/Electronics Engineering

Circuit Theory

· Determine the type of filter shown below and show that its cutoff frequency is $\omega_c = 1/RC$



→ It is a low pass filter, when the output of an RC circuit is taken off the capacitor. Then a low pass filter is formed.

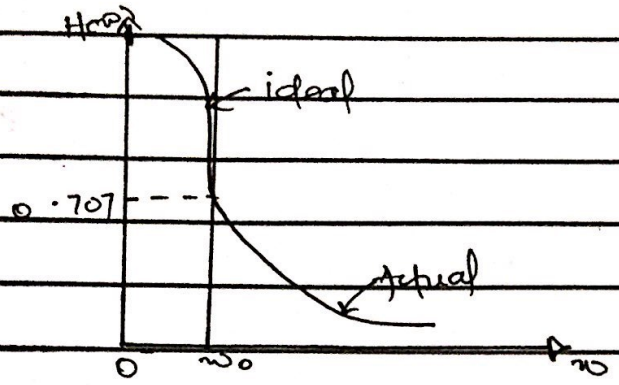
The transfer function can be given as: $H(\omega) = \frac{V_o}{V_i} = \frac{1/j\omega C}{R + 1/j\omega C}$

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

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

The half power frequency that is equivalent to the corner frequency on the bode plots but in the context of filters is usually known as the cut-off frequency ω_c is obtained by setting the magnitude of $H(\omega)$ equal to $1/\sqrt{2}$ thus

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



Ideal and Actual frequency response of low pass filter

The cut off frequency is also called the roll off frequency.