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17/Eng 04/052

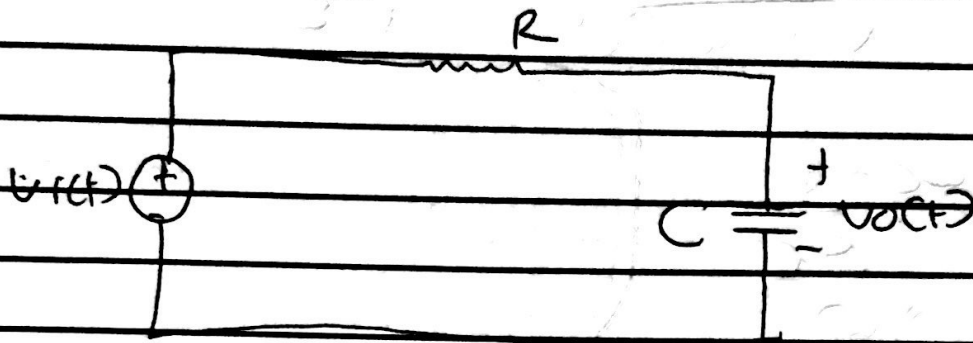
Electrical / Electronics

Electric Circuits Theory II

Assignment 1

Determine the type of filter shown below and show that its cut-off frequency is:

$$\omega_c = 1/RC$$



Answer

This is a low pass filter, A typical low pass filter is formed when the output of an RC circuit is taken off the capacitor.

The transfer function is

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

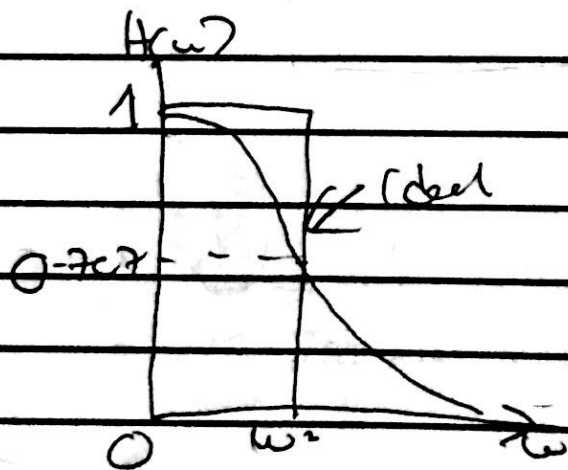
$$H(\omega) = \frac{1}{1 + j\omega RC}$$

The half-power frequency which is equal to the corner frequency or the Bode plots but in the context of ~~the~~ filters is usually known as the cut-off frequency ω_c is obtained by setting the magnitude of $A(\omega)$ equal to $1/\sqrt{2}$ (hence)

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

$$\omega_c = 1$$

$$RC$$



Ideal and actual frequency response of a low pass filter -