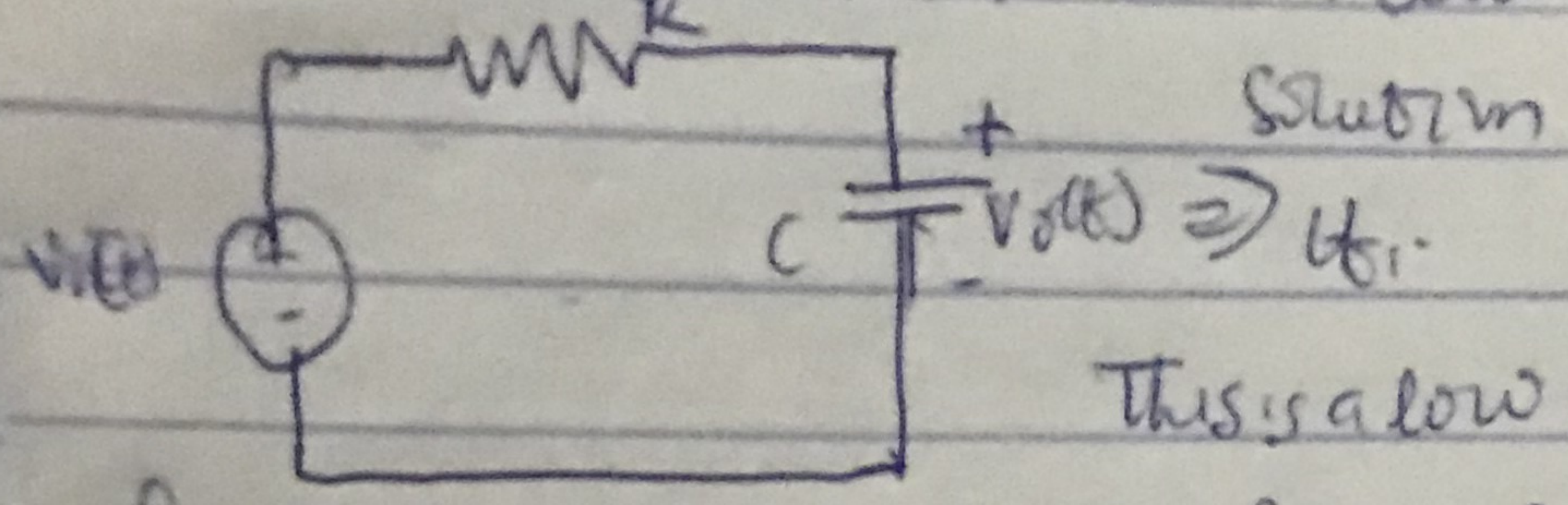


051 Udechukwu Ebenezer
19/EN0604/064

Electric Circuit Theory II Assignment

Determine the type of filter shown below and show that its cut-off frequency $\omega_c = 1/RC$



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

$$H(\omega) = \frac{V_2}{V_1} = \frac{1/j\omega C}{R + 1/j\omega C}$$

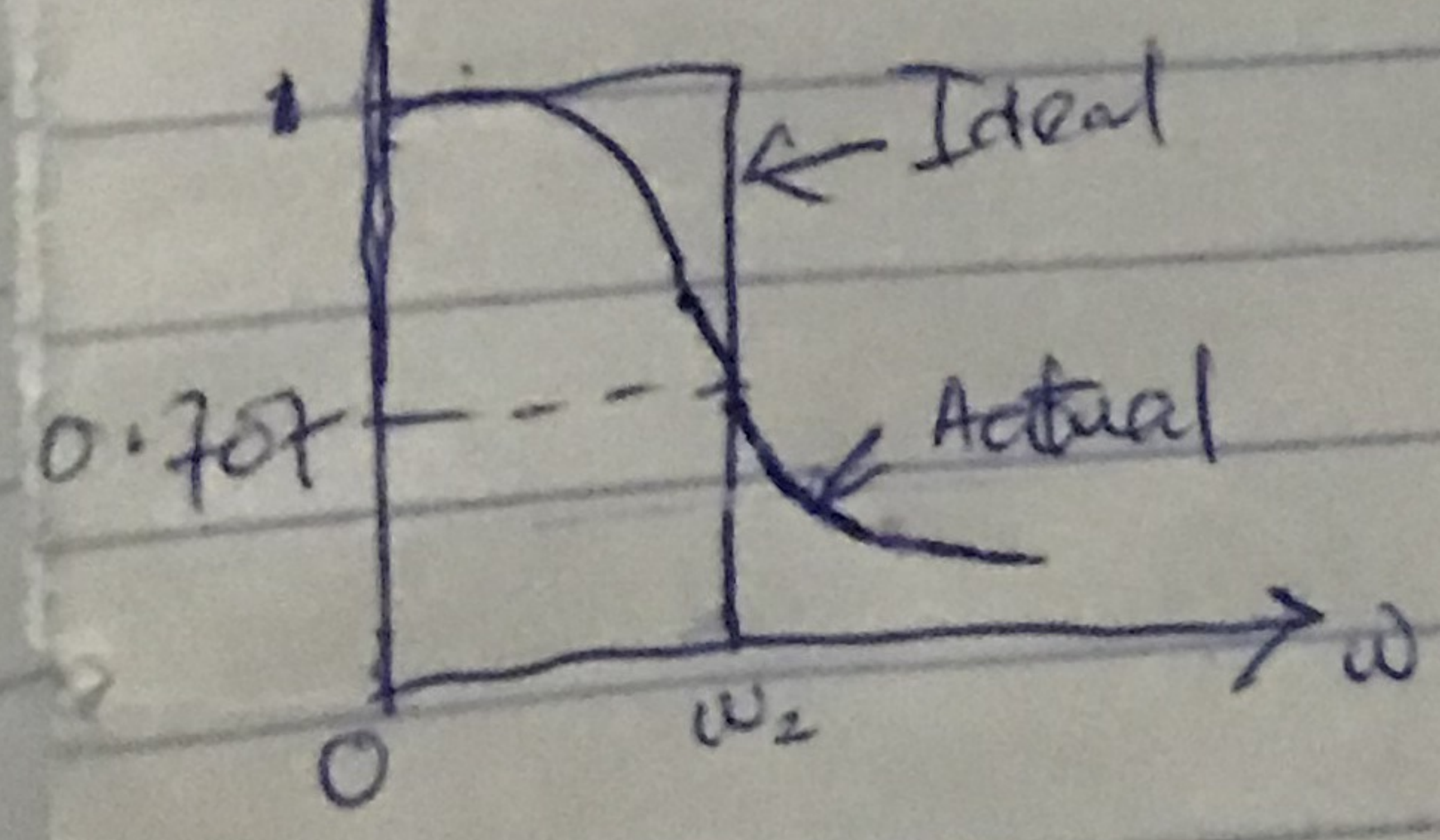
$$H(\omega) = \frac{1}{1 + j\omega RC}$$

Note: $H(0) = 1, H(\infty) = 0$

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

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

$$\omega_c = 1/RC$$



* Ideal and Actual frequency response of low pass filter.

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