

YAKUBU NATHAN BALA

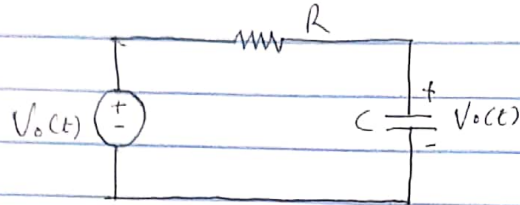
17/ENG04/076

ELECT.
EEE 322

ASSIGNMENT

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

$$\omega_c = 1/RC$$



Solution

The diagram above shows a low-pass filter, it is formed when the output of an RC circuit is taken off the capacitor.

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

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

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

The half-power frequency which 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,

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

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