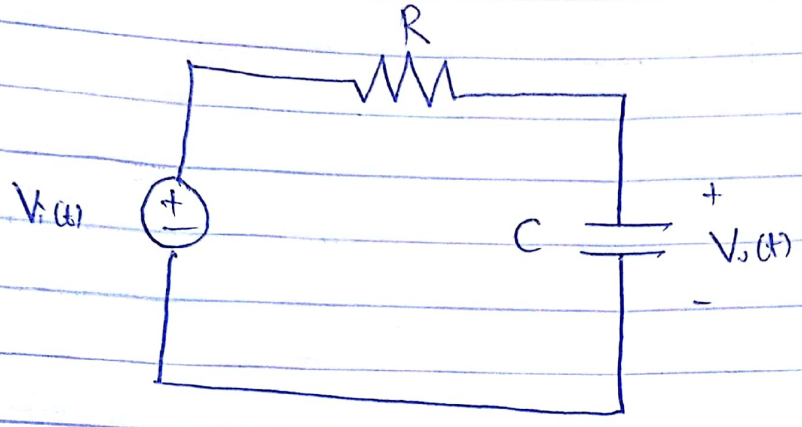
NAME: UFORO ANAIDIONG INEMESIT
DEPT: MECHATRONICS
MAT NO: 17/ENG05/041



The filter as seen here is a low pass filter. A low pass filter is one in which the output of an RC Circuit is taken off the Capacitor.

To obtain the Cut off frequency (ω_c), we first obtain the transfer function $H(\omega)$.

$$H(\omega) = \frac{V_o}{V_i}$$

$$C = \frac{1}{j\omega C}, \quad R = R$$

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

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

Cut off frequency W_c is obtained by equating the magnitude of the transfer function to $\frac{1}{\sqrt{2}}$

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

Now by Comparison

$$2 = 1 + w^2R^2C^2$$

$$w^2R^2C^2 = 2 - 1$$

$$w^2R^2C^2 = 1$$

$$\therefore wRC = 1$$

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

Note: The filter is a low-pass filter. This is because the output of the RC Series Circuit is taken off the Capacitor as shown in the circuit diagram.