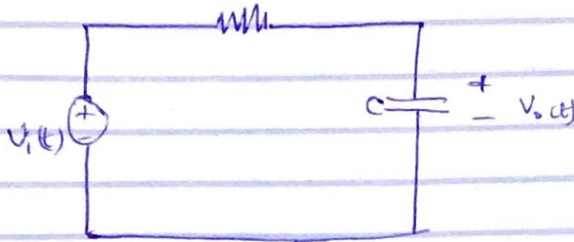


BOB FAVOUR HEAVY!  
18ENG02/03  
COMPUTER ENGINEERING

Circuit Theory (EEE322)  
-Assignment

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



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

$$H(\omega) = 1$$
$$H(\omega) = 0$$

The cut off frequency  $\omega_c$  is obtained by setting the magnitude of  $H(\omega)$  to  $1/\sqrt{2}$

$$|H(\omega)| = \left| \frac{1}{Rj\omega C + 1} \right| = \frac{1}{\sqrt{2}}$$

$$= \frac{\sqrt{1^2}}{\sqrt{1^2 + (j\omega RC)^2}} = \frac{1}{\sqrt{2}}$$

$$= \frac{1}{\sqrt{1 + \omega^2 R^2 C^2}} = \frac{1}{\sqrt{2}}$$

$$\sqrt{2} = \sqrt{1 + \omega^2 R^2 C^2}$$

Square of both sides

$$2 = 1 + \omega^2 R^2 C^2$$

$$2 - 1 = \omega^2 R^2 C^2$$

$$1 = \omega^2 R^2 C^2$$