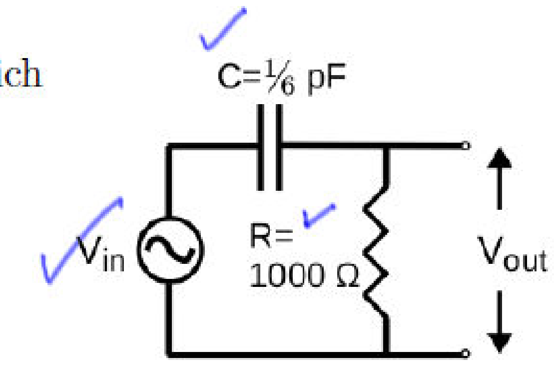
58. In the given circuit, what is the closest approximate frequency at which the ratio V_{out}/V_{in} is $1/\sqrt{2}$?



RC series circuit.

- [A] 0.16×10^6 Hz
- [B] 1.6×10^6 Hz
- [C] 10^9 Hz
- [D] 10^6 Hz

$$\frac{V_{out}}{V_{in}} = \frac{1}{\sqrt{2}} = \frac{iR}{iZ}$$

★ V_{in}, by loop rule.

Z = impedance of the circuit.

$$\sqrt{2}R = Z$$

$$\therefore 2R^2 = Z^2$$

$$\therefore 2R^2 = R^2 + X_C^2$$

$X_C \rightarrow$ capacitive reactance

$$\therefore R^2 = X_C^2$$

$$\therefore R = X_C = \frac{1}{2\pi f C}$$

$$f = \frac{1}{2\pi RC} = \frac{1}{6.28 \times 10^3 \times \frac{1}{6} \times 10^{-12}}$$

53. The dimension of $1/RC$, where R is the resistance and C is the capacitance, is the same as that of

[A] Current. [B] Charge. [C] Frequency. [D] Time.

$$\frac{6}{6.28} \times 10^9$$

$$\approx 1 \times 10^9 \text{ Hz}.$$