

3:30 pm

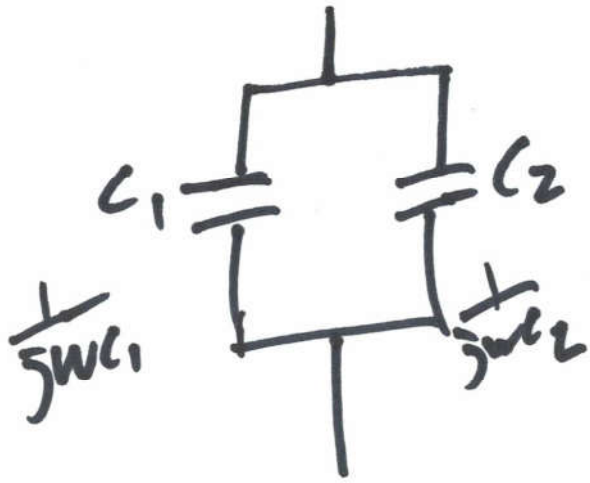
Chem 130

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leetcode.com

①

Frequency Response



$$C_1 + C_2 = C_{total}$$

$$\frac{1}{\frac{1}{C_1} + \frac{1}{C_2}} = C_{total}$$
$$\frac{C_1 C_2}{C_1 + C_2}$$

$$\frac{1}{j\omega C_{total}} = \frac{\frac{1}{j\omega C_1} \cdot \frac{1}{j\omega C_2}}{\frac{1}{j\omega C_1} + \frac{1}{j\omega C_2}} = \frac{\frac{1}{j\omega C_1} \cdot \frac{1}{j\omega C_2}}{\frac{C_1 + C_2}{j\omega C_1 C_2}} = \frac{1}{j\omega \cdot j\omega} \cdot \frac{j\omega C_1 C_2}{C_1 + C_2}$$
$$= j\omega (C_1 + C_2)$$

(2)

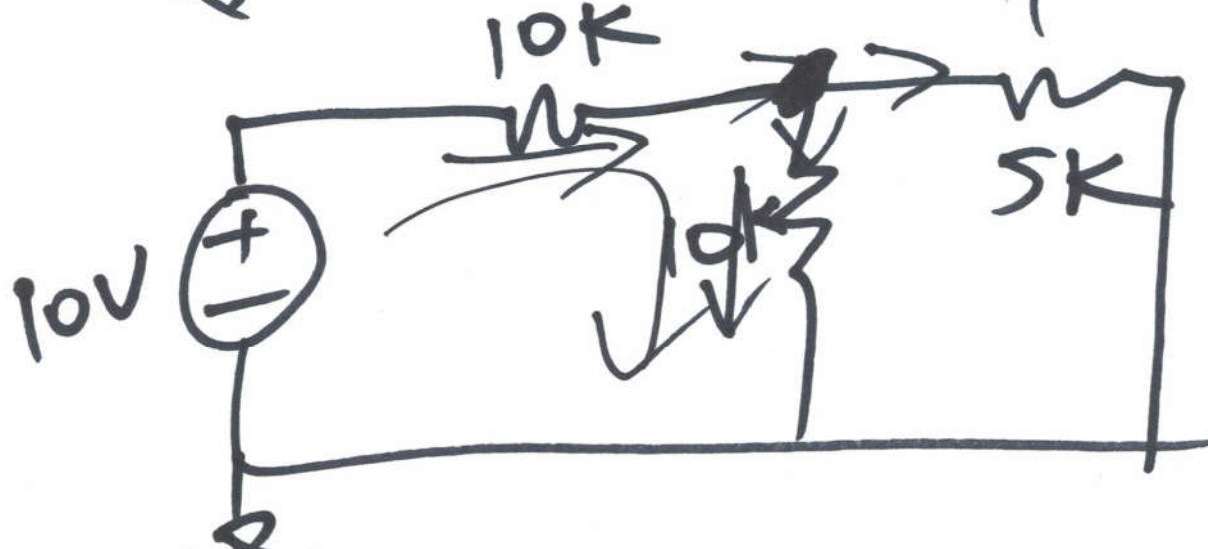
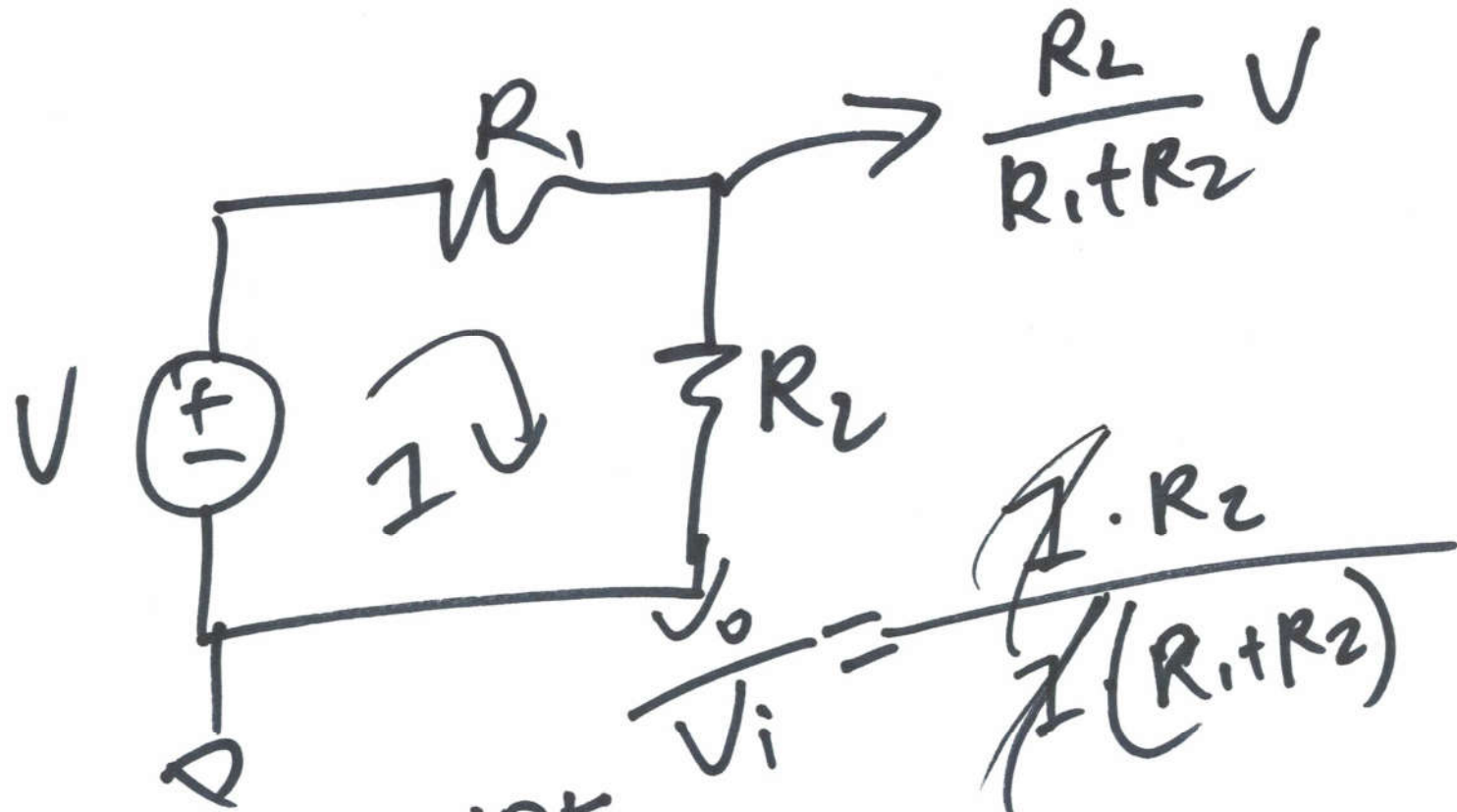
$$\frac{1}{j\omega C_{total}} = \frac{1}{j\omega C_1} + \frac{1}{j\omega C_2}$$
$$= \frac{C_1 + C_2}{j\omega C_1 C_2}$$

$$= \frac{1}{j\omega \left(\frac{C_1 C_2}{C_1 + C_2} \right)}$$

$$C_{total} = \frac{C_1 C_2}{C_1 + C_2}$$

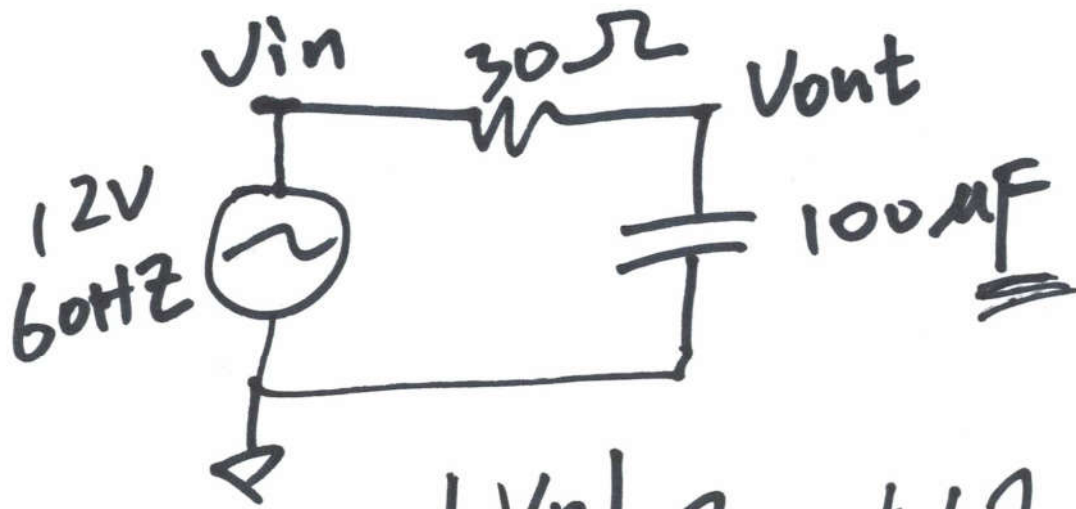
③

Voltage divider



$$\frac{10K \cdot 5K}{15K}$$
$$= \frac{50}{15}$$
$$= 3.333K$$

(4)



$$\frac{1}{j\omega C} \rightarrow 2\pi f$$

$\left| \frac{v_o}{v_i} \right|$? td ?

$$\frac{v_o}{v_i} = \frac{\frac{1}{j\omega C}}{R + \frac{1}{j\omega C}} = \frac{1 + 0j}{j\omega RC + 1}$$

$$\left| \frac{v_o}{v_i} \right| = \frac{\sqrt{1^2 + 0^2}}{\sqrt{1^2 + \omega RC^2}} = \frac{1}{\sqrt{1 + (2\pi f RC)^2}}$$

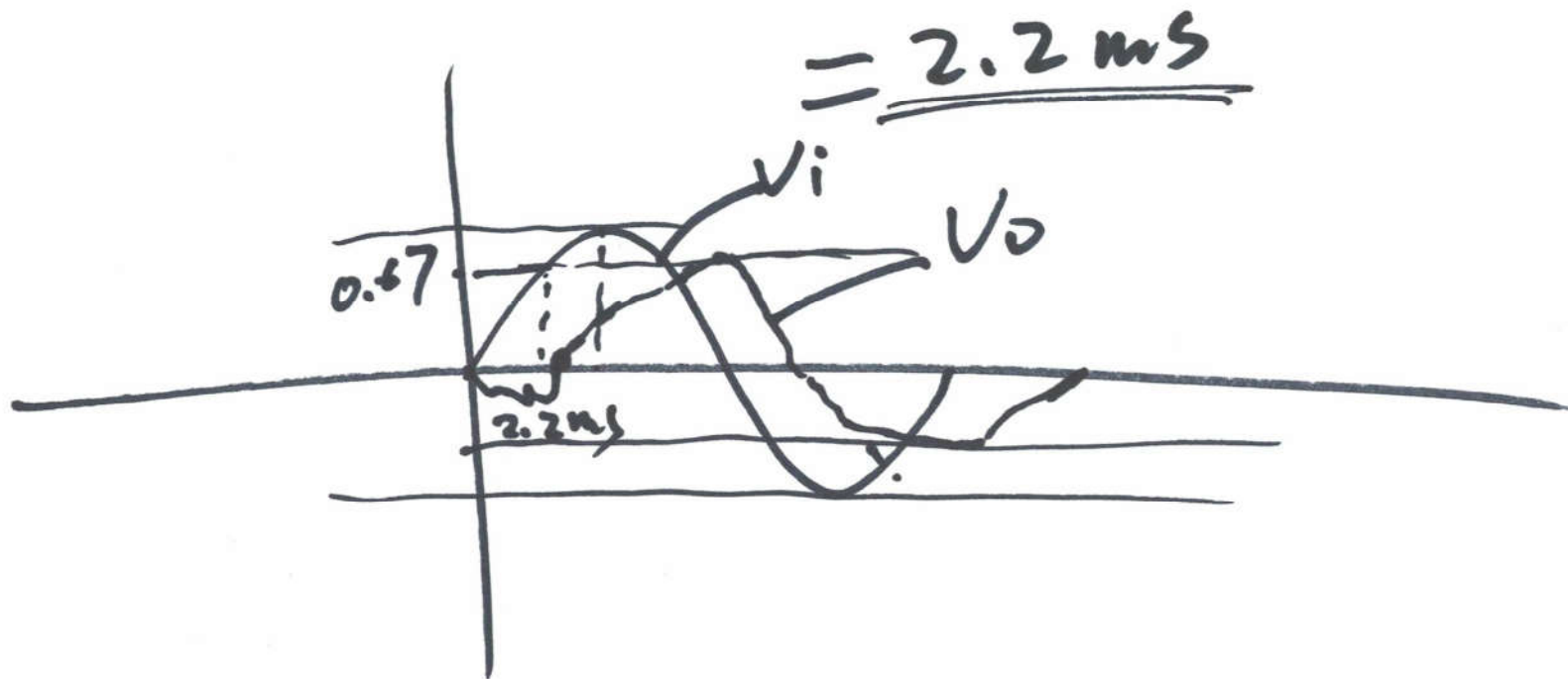
$$2\pi f RC = \frac{6.28 \cdot 60 \cdot 30 \cdot 100\mu F}{1} = 1.13$$

$$\frac{1}{\sqrt{1 + 1.3}} = \frac{1}{1.5} = 0.67$$

(5)

$$\begin{aligned} \angle \theta &= \angle V_o - \angle V_i = \tan^{-1} \frac{0}{1} - \tan^{-1} \frac{WR}{1} \\ &= 0^\circ - \tan^{-1} 1.13 \\ &= \underline{\underline{-48.5^\circ}} \end{aligned}$$

$$t_d = \frac{\angle \theta}{360^\circ} \cdot T = \frac{48.5^\circ}{360^\circ} \cdot \frac{1}{60} \text{ s}$$



⑥