BÀI TẬP CUỐI CHƯƠNG III

III.1. Câu A.

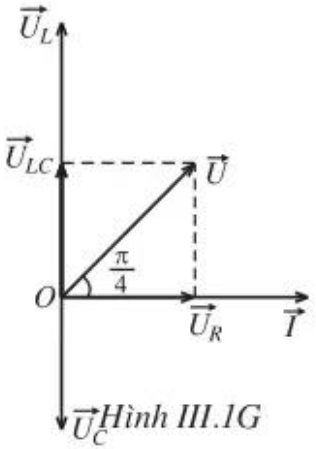
- Dòng điện một chiều : $R = \dfrac{U}{I} = \dfrac{12}{0,15} = 80\ \Omega$

- Dòng điện xoay chiều : $I = \dfrac{U}{\sqrt{R^2 + Z_L^2}} = 1 \Rightarrow Z_L = 60\ \Omega$.

III.2. Câu B.

Xem giản đồ Fre-nen (H.III.1G)

$U_{LC} = U_L - U_C = U_R$



Hình III.1G

III.3. Câu D.

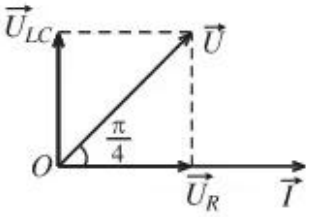
Xem giản đồ Fre-nen (H.III.2G)

$U_{LC} = U_L - U_C = U_R$

$Z_L - Z_C = R$

$\Rightarrow Z_L = R + Z_C = 200$

$\Rightarrow L = \dfrac{2}{\pi}$ (H)



Hình III.2G

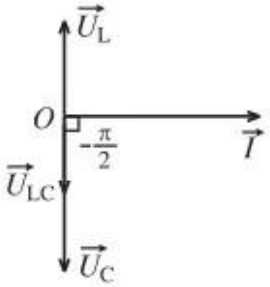
III.4. Câu C.

$Z_L = L\omega = L.2\pi f = 0,2.100\pi = 20\pi\ (\Omega)$

$Z_C = \dfrac{1}{C\omega} = \dfrac{1}{C.2\pi f} = \dfrac{1}{10.10^{-16}.100\pi} = \dfrac{10^3}{\pi}\ (\Omega)$

$Z_C > Z_L \Rightarrow U_C > U_L$

Từ Hình III.3G, U_{LC} trễ pha $-\dfrac{\pi}{2}$ so với I.



Hình III.3G

III.5. Câu C.

$$I = \frac{U}{\sqrt{R^2 + (Z_L - Z_C)^2}} \Rightarrow \sqrt{2} = \frac{200}{\sqrt{R^2 - 100^2}}$$

$\Rightarrow R = 100\ \Omega.$

III.6. Câu B. **III.7.** Câu C.

III.8. Câu A.

$$\left.\begin{array}{l} 2\pi f_1 L = 6\Omega \\ \dfrac{1}{2\pi f_1 C} = 8\Omega \end{array}\right\} \Rightarrow L = 48C$$

$$\cos\varphi = \frac{R}{\sqrt{R^2 + (Z_L - Z_C)^2}} = 1$$

$$\Rightarrow \quad 2\pi f_2 L = \frac{1}{2\pi f_2 C}$$

Thay $L = 48C$ vào, ta được :

$$\left.\begin{array}{l} 2\pi f_2 C = \dfrac{1}{\sqrt{48}} \\ 2\pi f_1 C = \dfrac{1}{8} \end{array}\right\} \Rightarrow f_2 = \frac{2}{\sqrt{3}} f_1$$

III.9. Câu D.

$$I = \frac{U_{AN}}{\sqrt{R^2 + Z_L^2}} = \frac{U}{\sqrt{R^2 + (Z_L - Z_C)^2}}$$

$$U_{AN} = U\sqrt{\frac{R^2 + Z_L^2}{R^2 + (Z_L - Z_C)^2}}$$

Muốn U_{AN} không phụ thuộc R thì $Z_L^2 = (Z_L - Z_C)^2$

$$\Rightarrow Z_C = 2Z_L \Rightarrow \omega = \frac{1}{\sqrt{2LC}}$$

III.10. Câu C.

$$\left.\begin{array}{l}\dfrac{U}{\sqrt{R^2+Z_L^2}}=1\\[2ex]\dfrac{3U}{\sqrt{R^2+9Z_L^2}}=\sqrt{3}\end{array}\right\}Z_L=\frac{R}{\sqrt{3}}\Rightarrow Z_L'=2Z_L=\frac{2R}{\sqrt{3}}.$$

III.11. Câu A.

Xem giản đồ Fre-nen (H.III.4bG).

$U_C = U_{LR} \Rightarrow \Delta OPQ$ cân : POQ = PQO

Xét ΔOHQ, ta có :

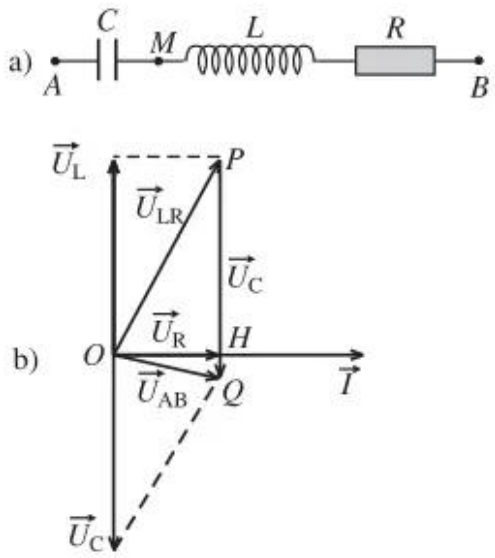
$$HQO = 90^o - 15^o = 75^o$$

$\Rightarrow POQ = 75^o$

$\Rightarrow POH = 60^o$

$$\cos\varphi = \frac{R}{Z_{LR}} = \frac{U_R}{U_{LR}} = \cos 60^o$$

$\Rightarrow \cos\varphi = 0,5$



Hình III.4G

III.12. Câu B. **III.13.** Câu C.

III.14. Câu A.

Áp dụng công thức $f = pn \Rightarrow n = \dfrac{f}{p} = \dfrac{50}{4}$ (vòng/giây) = 750 vòng/phút.

III.15. Câu D.

$$i_3 = I\sqrt{2}\cos\left(\omega t - \frac{4\pi}{3}\right) = I\sqrt{2}\cos\left(\omega t - \frac{4\pi}{3} + 2\pi\right)$$

$$= I\sqrt{2}\cos\left(\omega t + \frac{2\pi}{3}\right)$$

III.16. $Z_{C_1} = 400\ \Omega$; $Z_{C_2} = 200\ \Omega$

$$P = RI^2 = \frac{RU^2}{R^2 + (Z_L - Z_C)^2} \Rightarrow (Z_L - Z_{C_1})^2 = (Z_L - Z_{C_2})^2$$

$$\Rightarrow \quad Z_L = \frac{Z_{C_1} + Z_{C_2}}{2} = 300\ \Omega$$

$$L = \frac{Z_L}{\omega} = \frac{3}{\pi}\ \text{(H)}$$

III.17. a) $Z = \sqrt{R^2 + (Z_L - Z_C)^2} = 180,3\ \Omega$

$$\cos\varphi = \frac{R}{Z} = 0,832$$

$$I = \frac{U}{Z} = \frac{220}{180,3} = 122\ \text{A}$$

$$P = UI\cos\varphi = 223\ \text{W}$$

b) $\mathscr{P}_{max}$ khi $Z_{C'} = Z_L = L\omega$

$$C' = \frac{1}{\omega^2 L} = 32,2.10^{-6}\ \text{F}$$

III.18. Xem giản đồ Fre-nen (H.III.5G)

$$Z_L = \omega L = 100\pi.\frac{1}{10\pi} = 100\ \Omega\ ;$$

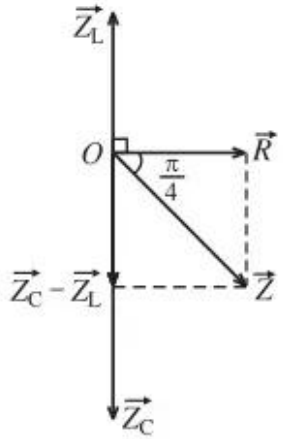
$$Z_C = \frac{1}{\omega C} = \frac{1}{100\pi.\frac{10^{-3}}{2\pi}} = 20\ \Omega$$

$$Z = \sqrt{R^2 + (Z_L - Z_C)^2}$$

$$\Rightarrow \quad Z = 10\sqrt{2} = Z_L\sqrt{2}$$

$$U = \sqrt{2}U_L = 20\sqrt{2}$$

$$\Rightarrow \quad u = 40\cos\left(100\pi t - \frac{\pi}{4}\right)\ \text{(V)}.$$

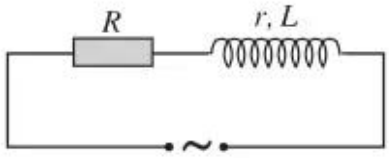


Hình III.5G

III.19. Khi tụ điện bị nối tắt (H.III.6G)

$$U_R = U_{Lr} \Rightarrow R = \sqrt{r^2 + Z_L^2}$$

$$\Rightarrow \quad r^2 + Z_L^2 = 60^2 \qquad \text{(a)}$$



Hình III.6G

$$U_R = IR = \frac{UR}{\sqrt{(R+r)^2 + Z_L^2}} = \frac{150.60}{\sqrt{(60+r)^2 + Z_L^2}} = 50\sqrt{3}$$

Kết hợp với (a) : $r = 30\ \Omega$ và $Z_L = 30\sqrt{3}\ \Omega$.

Khi tụ điện không bị nối tắt :

$$P = (R+r)I^2 = \frac{(R+r)U^2}{(R+r)^2 + (Z_L - Z_C)^2}$$

$$\Rightarrow \frac{90.(150)^2}{90^2 + (Z_L - Z_C)^2} = 250$$

$$\Rightarrow Z_L - Z_C = 0 \Rightarrow Z_C = Z_L = 30\sqrt{3}\ \Omega.$$