ĐÁP ÁN MÔN MẠCH ĐIỆN

Câu 1: 2 điểm

Hở mạch:

$$\begin{cases} \dot{U}_a\left(\frac{1}{50}+\frac{1}{-j100}\right)-\frac{\dot{U}_c}{50}=0 \\ \dot{U}_c\left[\left(\frac{1}{20+10j}\right)+\frac{1}{50}\right]-\frac{250\angle 0^\circ}{(20+10j)}-\frac{\dot{U}_a}{50}=0,03\dot{U}_o \end{cases}$$ 0,25đ

$$\Rightarrow \begin{cases} \dot{U}_a=\dot{U}_{ab}=500\angle -53,13^\circ\ (V) \\ \dot{U}_c=559,02\angle -26,57^\circ\ (V) \end{cases}$$ 0,25đ

Ngắn mạch:

$$\dot{I}_{ng}=\frac{250\angle 0^\circ}{20+10j+50}=3,54\angle -8,13^\circ\ (A)$$ 0,5đ

$$Z_{td}=100\sqrt{2}\angle -45^\circ\ (\Omega)=100-100j\ (\Omega)$$ 0,25đ

Để công suất trên R_L đạt cực đại, điều kiện là:

$$R_L=100\sqrt{2}\ (\Omega)$$ 0,25đ

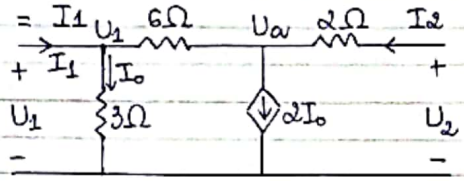
$$\dot{I}=\frac{500\angle -53,13^\circ}{Z_{td}+R_L}=1,92\angle -30,63^\circ\ (A)$$ 0,25đ

$$\mathcal{P}_{R_L\max}=R_L.I^2=517,54W$$ 0,25đ

Câu 2: 2 điểm

a)

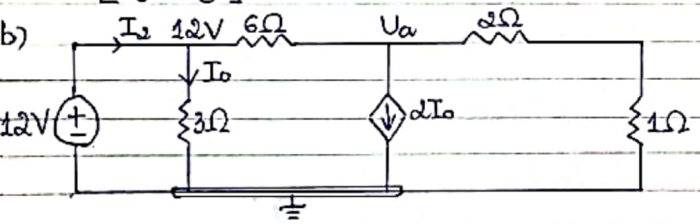
$$\begin{cases} \dot{U}_a\left(\frac{1}{6}+\frac{1}{2}\right)-\frac{\dot{U}_1}{6}-\frac{\dot{U}_2}{2}=-2\dot{I}_o \\ \dot{U}_1\left(\frac{1}{6}+\frac{1}{3}\right)-\frac{\dot{U}_a}{6}=\dot{I}_1 \\ \dot{U}_2-\dot{U}_a=2\dot{I}_2 \\ \dot{I}_o=\frac{\dot{U}_1}{3} \end{cases}$$ 0,5đ



$$\Rightarrow \begin{cases} \dot{I}_1=\frac{5}{8}\dot{U}_1-\frac{1}{8}\dot{U}_2 \\ \dot{I}_2=\frac{3}{8}\dot{U}_1+\frac{1}{8}\dot{U}_2 \end{cases} \Rightarrow \begin{cases} \dot{U}_1=\dot{I}_1+\dot{I}_2 \\ \dot{U}_2=-3\dot{I}_1+5\dot{I}_2 \end{cases}$$ 0,25đ 0,25đ

$$\Rightarrow Z=\begin{bmatrix} 1 & 1 \\ -3 & 5 \end{bmatrix}\ (\Omega)$$

b)



$$\begin{cases} \dot{U}_a\left(\frac{1}{3}+\frac{1}{6}\right)-\frac{12}{6}=-2\dot{I}_o \\ \dot{I}_o=\frac{12}{3}=4\ (A) \end{cases} \Rightarrow \dot{U}_a=-12V$$ 0,25đ

$$\mathcal{P}_{tải}=\frac{(12-U_a)^2}{6}+\frac{U_a^2}{3}+\frac{12^2}{3}=192W$$ 0,25đ

$$\mathcal{P}_{nguồn}=12\dot{I}_2-U_a.2\dot{I}_o=192W$$ 0,25đ

$$\dot{I}_2=\dot{I}_o-\left(\frac{U_a-12}{6}\right)=8A$$ 0,25đ

Câu 3: 2 điểm

$$Z_{td}=-jX_c+\frac{r.2j}{r+2j}=\frac{4r}{r^2+4}+j\left(\frac{2r^2}{r^2+4}-X_c\right)$$ 0,5đ

$$\mathcal{P}=U.I\Rightarrow I=4A$$ 0,25đ

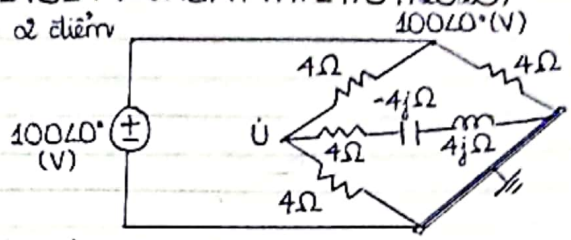
$$\begin{cases} \frac{U}{I}=\frac{4r}{r^2+4}=\frac{1}{4} \\ \frac{2r^2}{r^2+4}-X_c=0 \end{cases}$$ 0,25đ 0,5đ

$$\Rightarrow \begin{cases} r=15,75\Omega, X_c=1,968\Omega \\ r=0,254\Omega, X_c=0,032\Omega \end{cases}$$ 0,5đ

ELCI140144 (NGÀY THI 14/07/2020)

Câu 4: 2 điểm

ĐKBĐ:



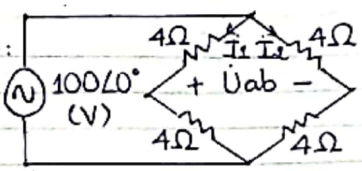
$$\dot{U}\left(\frac{1}{4}+\frac{1}{4}+\frac{1}{4}\right)=\frac{100\angle 0^\circ}{4}\Rightarrow \dot{U}=\frac{100}{3}\angle 0^\circ\ (V)$$ 0,25đ

$$\dot{I}=\frac{\dot{U}}{4}=\frac{25}{3}\angle 0^\circ\ (A);\ \dot{U}_c=(-4j)\dot{I}=\frac{100}{3}\angle -90^\circ\ (V)$$

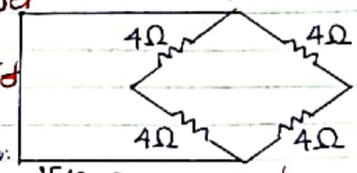
$$\begin{cases} i_L(t)=\frac{25}{3}\cos 8t\ (A) \\ u_c(t)=\frac{100}{3}\cos(8t-90^\circ)\ (V) \end{cases} \Rightarrow \begin{cases} i_L(-0)=\frac{25}{3}A \\ u_c(-0)=0 \end{cases}$$ 0,25đ 0,25đ

Áp dụng định lý thevenin:

Hở mạch: $\dot{I}_1=\dot{I}_2=\frac{100\angle 0^\circ}{4+4}=12,5A$



$$U_{ab}=4(\dot{I}_2-\dot{I}_1)=0\ (V)$$ 0,25đ



$$R_{td}=\frac{4}{2}+\frac{4}{2}=4(\Omega)$$ 0,25đ

Mạch tương đương thevenin:

$$\dot{I}=\frac{25/6}{8+32/p+0,5p}=\frac{25/3.p}{(p+8)2}$$ 0,5đ

$$\Rightarrow i(t)=\frac{25}{3}e^{-8t}-\frac{200}{3}t.e^{-8t}\ (A)$$ 0,25đ

Câu 5: 2 điểm.

a)

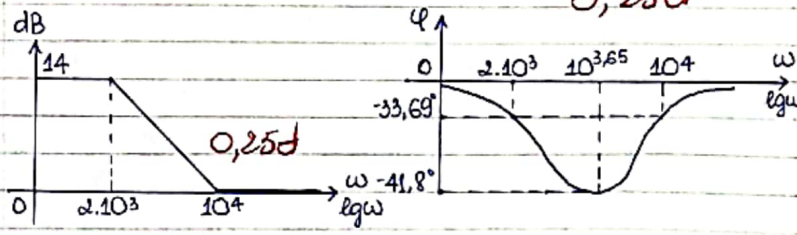
$$\begin{cases} \dot{U}_a\left(\frac{1}{9+10^4/p}+\frac{1}{1+10^4/p}\right)-\dot{U}_1\left(\frac{1}{9+10^4/p}\right)=0 \\ \dot{U}_b\left(\frac{1}{2}+\frac{1}{18}\right)-\dot{U}_2.\frac{1}{18}=0;\ \dot{U}_a=\dot{U}_b \end{cases}$$ 0,25đ

$$\Rightarrow W(p)=\frac{U_2}{U_1}=\frac{p+10^4}{p+2.10^3}$$ 0,25đ

TSG = 2.10^3, 10^4; thay $p=j\omega$. $\Rightarrow W(j\omega)=\frac{j\omega+10^4}{j\omega+2.10^3}$

$20\lg|W(j\omega)|_{\omega=0}=14dB$ 0,25đ

$$\varphi=\text{arctg}\frac{\omega}{10^4}-\text{arctg}\frac{\omega}{2.10^3}$$ 0,25đ



b) $u_2(t)=50+134,83\sin(10^3t-20,85^\circ)+28,95\sin(3.10^3t+5,39^\circ)\ (V)$ 0,5đ

$$U_2(h/d)=\sqrt{50^2+\left(\frac{134,83}{\sqrt{2}}\right)^2+\left(\frac{28,95}{\sqrt{2}}\right)^2}=109,58\ (V)$$ 0,25đ