

**ĐÁP ÁN MẠCH ĐIỆN**  
 ELCI140144 - thi ngày 12/06/2018

**Câu 1:**

a) 
$$\begin{cases} I_1(20+20j) + 20jI_2 - 5jI_2 = \dot{u}_1 \\ I_2(20j+10j) + 20jI_1 - 5jI_2 - 5jI_2 - 5jI_1 = \dot{u}_2 \end{cases}$$

$$\Leftrightarrow \begin{cases} \dot{u}_1 = I_1(20+20j) + I_2(15j) \\ \dot{u}_2 = I_1(15j) + I_2(20j) \end{cases}$$

Thông số  $Z = \begin{bmatrix} 20+20j & 15j \\ 15j & 20j \end{bmatrix} (\Omega)$

b) 
$$\begin{cases} 120 \angle 0^\circ = I_1(20+20j) + I_2(15j) \\ -15I_2 = 15jI_1 + 20jI_2 \end{cases}$$

$$\Leftrightarrow \begin{cases} I_1 = 4,22 \angle -26,74^\circ (A) \\ I_2 = 2,53 \angle -169,87^\circ (A) \end{cases}$$

hoặc  $I_2 = 2,53 \angle 10,12^\circ (A)$

$P_{\text{ tải } 15\Omega} = \frac{15 \cdot 2,53^2}{2} = 48W$

$P_{\text{ nguồn}} = UI \cos \phi = \frac{1}{2} \cdot 120 \cdot 4,22 \cos(26,75^\circ) = 226W$

**Câu 2:**

Hở mạch:

$$\begin{cases} I_a(5+5j) - 0,1\dot{u}_0 - 5 = 100 \angle 0^\circ \\ \dot{u}_0 = 5jI_a \end{cases} \Leftrightarrow \begin{cases} I_a = 16,8j \\ \dot{u}_0 = 40+80j \end{cases}$$

$\dot{u}_{ab} - \dot{u}_0 - 0,1\dot{u}_0(-5j) = 80+60j = 100 \angle 36,87^\circ (V)$

Ngắn mạch:

$$\dot{u}_0 \left( \frac{1}{5} + \frac{1}{5j} + \frac{1}{-5j} \right) - \frac{100 \angle 0^\circ}{5} = 0$$

$\Leftrightarrow \dot{u}_0 = 100 \angle 0^\circ (V)$

$I_{ng} = \frac{\dot{u}_0}{-5j} + 0,1\dot{u}_0 = 10 + 20j (A)$

$Z_{tt} = \frac{\dot{u}_{ab}}{I_{ng}} = 4 - 2j = 4,47 \angle -26,56^\circ (\Omega)$

Đe  $P_{\text{ max}}$ ,  $R = 4,47 = 2\sqrt{5} (\Omega)$

$I = \frac{\dot{u}_{ab}}{Z_{tt} + R} = 11,49 \angle 50,15^\circ (A)$

$P_{\text{ max}} = \frac{11,49^2 \cdot 2\sqrt{5}}{2} = 295 (W)$

**Câu 3:**

$U_{\text{ nguồn}} = \sqrt{3} \cdot 220V = 380(V)$

$\Delta \rightarrow Y : Z_Y = \frac{6-15j}{3} = 2-5j (\Omega)$

$Z_Y' = 2+2j + 2-5j = 4-j (\Omega)$

$U_{\text{ tải}}' = \frac{380}{\sqrt{3}} = 220 (V)$

$I_p' = I_d = \frac{U_{\text{ tải}}'}{\sqrt{R'^2 + X_Y'^2}} = \frac{220}{\sqrt{4^2 + (-3)^2}} = 44 (A)$

$I_p = \frac{I_d}{\sqrt{3}} = \frac{44}{\sqrt{3}} = 25,4 (A)$

$P_{\text{ đtđ}} = 3 \cdot 2 \cdot 44^2 = 11616 (W)$

$Q_{\text{ tm}} = 3(-3) \cdot 44^2 = -17424 (Var)$

$P_{\text{ tm}} = 3 \cdot 4 \cdot 44^2 = 23232 (W)$

**Câu 4:**

$t < 0 : K_1 \text{ đóng}, K_2 \text{ mở}$

$I = \frac{40\sqrt{2} \angle 45^\circ}{2j + 4 - 2j} = 10\sqrt{2} \angle 45^\circ (A)$

$\dot{u}_c = I(-2j) = 20\sqrt{2} \angle -45^\circ$

$u_c(t) = 20\sqrt{2} \cos(t - 45^\circ)$

$u_c(0) = 20(V)$

$0 < t < 0,5s : K_1 \text{ đóng}, K_2 \text{ mở}$

$I(p) = \frac{40/p - 20/p}{4 + 2/p} (A)$

$u_c(p) = I(p) \cdot \frac{2}{p} + \frac{20}{p} (V)$

$u_c(t) = 40 - 20e^{-0,5t} (V)$

$t = 0,5s$

$u_c(0,5s) = 24,42 (V)$

$t > 0,5s$

$I_{L1} = \frac{40/p}{2 + 2/p} (A)$

$\Rightarrow i_{L1}(t-0,5s) = 20 - 20e^{-(t-0,5s)} (A)$

$I(p) = \frac{40/p - 24,42/p}{4 + 2/p} = \frac{3,895}{p + 0,5} (A)$

$u_c(t-0,5s) = 40 - 15,58e^{-(t-0,5s)} (V)$

Câu 5:

$$\begin{cases} U_a \left( \frac{1}{2} + \frac{1}{8} + \frac{1}{4} + \frac{P}{8} + \frac{P}{8} \right) - \frac{U_1}{2} - \frac{U_c P}{8} - \frac{U_b P}{8} - \frac{U_c}{4} = 0 & 0,25đ \\ U_c \left( \frac{1}{2} + \frac{P}{8} \right) - \frac{U_b}{2} - \frac{U_a P}{8} = 0 & 0,25đ \\ U_d \left( \frac{1}{2} + \frac{1}{4} \right) - \frac{U_b}{2} - \frac{U_c}{4} = 0 & 0,25đ \\ U_c = U_d = 0 \end{cases}$$

$$W(P) = \frac{U_2}{U_1} = \frac{8P}{P^2 + 4P + 28} \quad 0,5đ$$

$$u_2(t) = 10,12 \cos(2t + 105,57^\circ) + 102,85 \sin(5t + 34,53^\circ) \text{ (V)} \quad 0,5đ$$

$$U_2(\text{hld}) = \sqrt{\frac{10,12^2}{2} + \frac{102,85^2}{2}} = 73,07 \text{ (V)} \quad 0,25đ$$