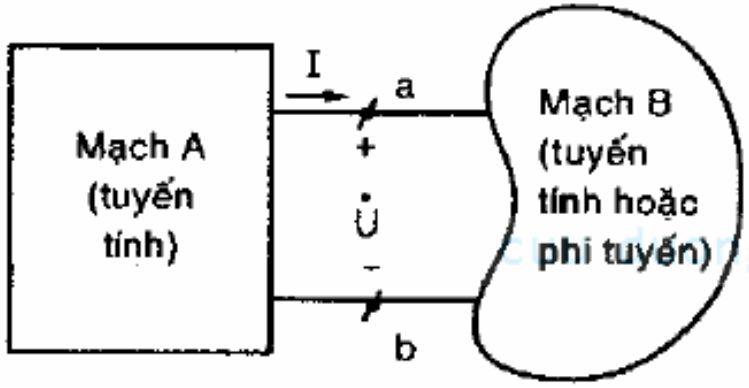
3.6.3 Định lý Thévenin - Norton

a) Phát biểu:



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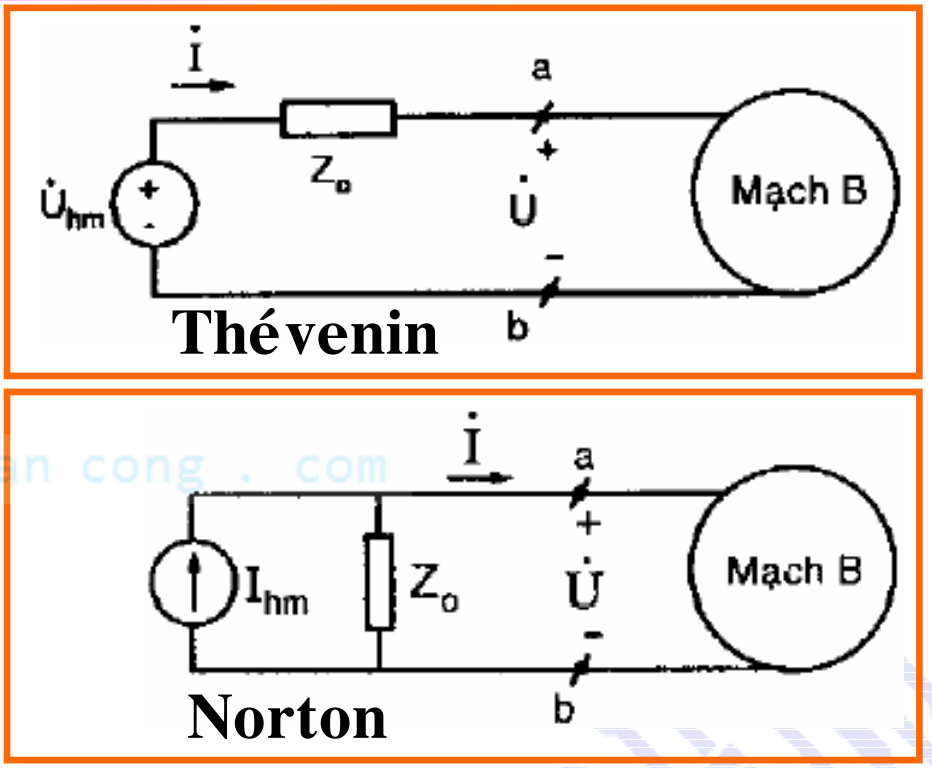


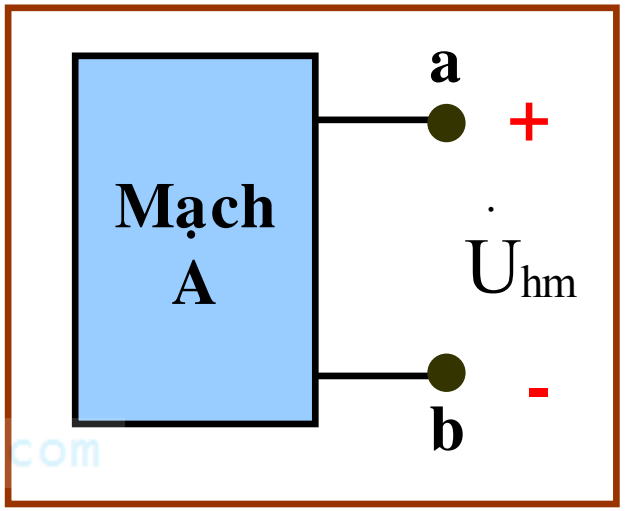
❖ **Trong đó:**

- U_{hm} : **điện áp hở mạch trên cửa a-b.**
- I_{nm} : **dòng ngắn mạch qua cửa a-b .**
- Z_0 : **Z_v mạng một cửa không nguồn.**

b) Tìm U_{hm} và I_{nm} :

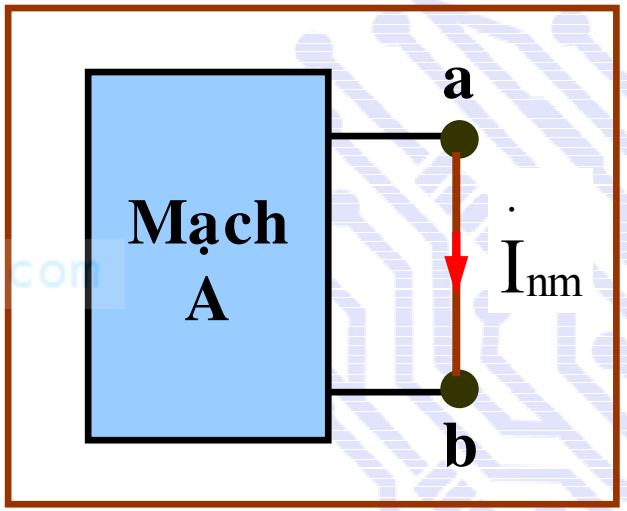
❖ Tìm U_{hm} :

- Cho hở mạch cửa a-b và giải.
- Dùng các PP : biến đổi tđ, thế nút, dòng mlưới , ... tìm áp.



❖ Tìm $\dot{I}_{nm}$:

- Ngắn mạch cửa a-b bằng dây dẫn.
- Dùng các PP : biến đổi tđ, dòng mlưới , thế nút, ... tìm dòng.



c) Tìm Z_0 :

c_1) *Mạch A không nguồn phụ thuộc :*

Triệt tiêu nguồn đlập & Tương đương trở kháng

c_2) *Mạch A có nguồn phụ thuộc :* **Có 2 cách tìm Z_0 :**

i. **Tìm đủ :** $\dot{U}_{hm}$ & $\dot{I}_{nm}$ ⟹ $Z_o = \dot{U}_{hm} / \dot{I}_{nm}$

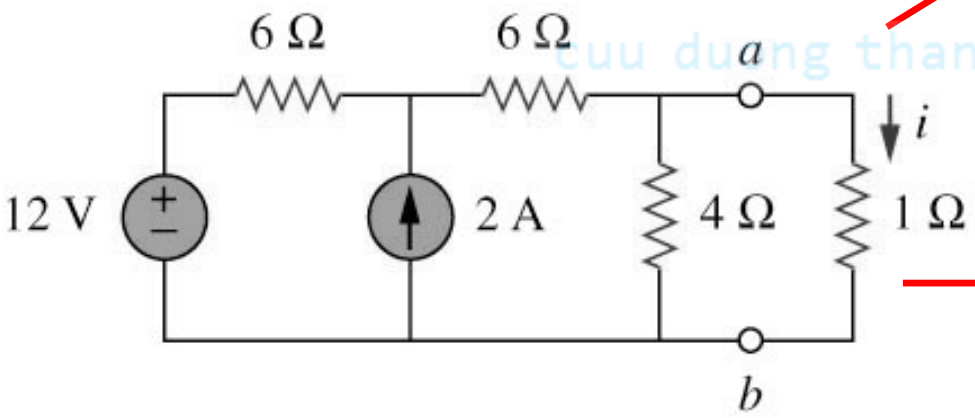
ii. **Triệt tiêu nguồn đlập.** ⟹ **Đặt nguồn đơn vị vào cửa.**

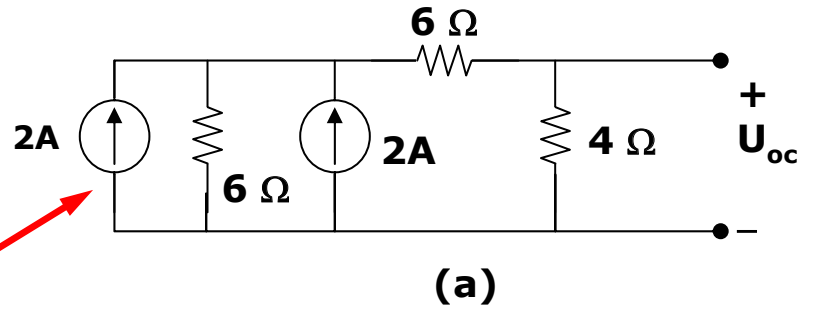
⟹ **Tính áp hay dòng qua cửa.**

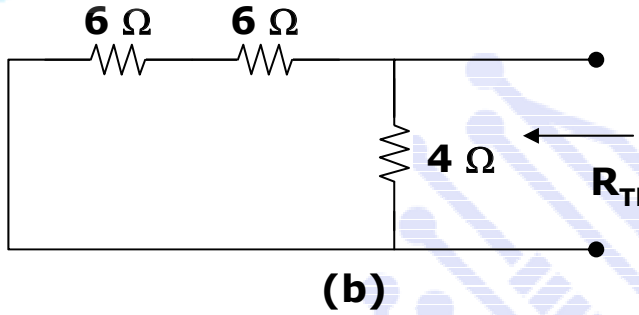
⟹ **Lập tỉ số :** $Z_o = \dfrac{1\angle 0^o \text{ V}}{\dot{I}}$ **hay** $Z_o = \dfrac{\dot{U}}{1\angle 0^o \text{ A}}$

❖Example1: Thevenin-Norton Circuit

Using Thevenin's theorem, find the equivalent circuit to the left of the terminals in the circuit shown below. Hence find i.



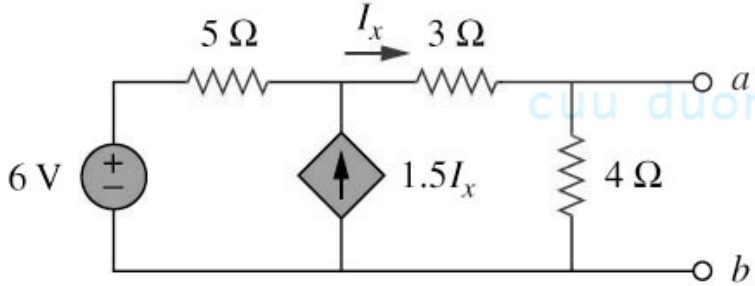


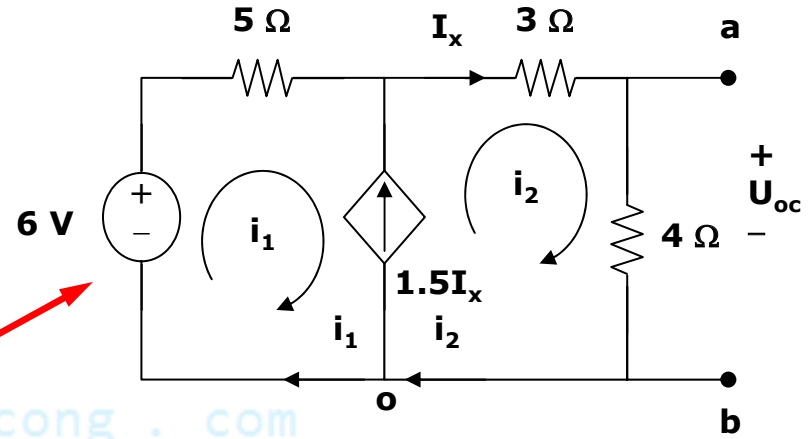


*Refer to in-class illustration, textbook, answer U_{oc} = 6V, R_{TH} = 3Ω, i = 1.5A

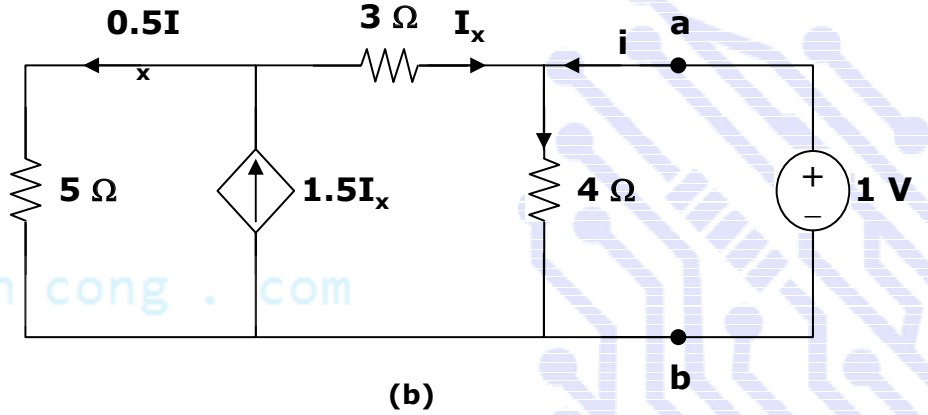
❖Example2: Thevenin-Norton Circuit

Find the Thevenin equivalent circuit of the circuit shown below to the left of the terminals.





(a)



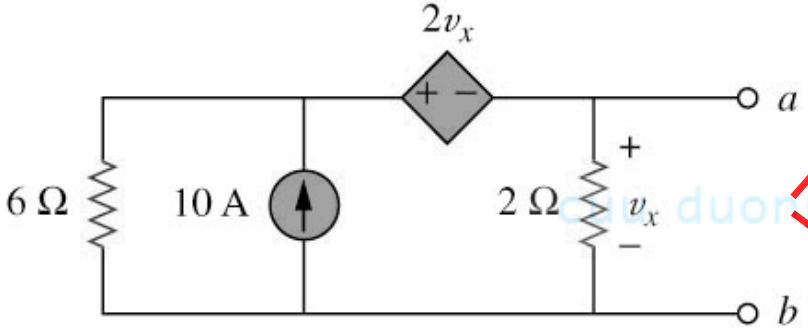
(b)

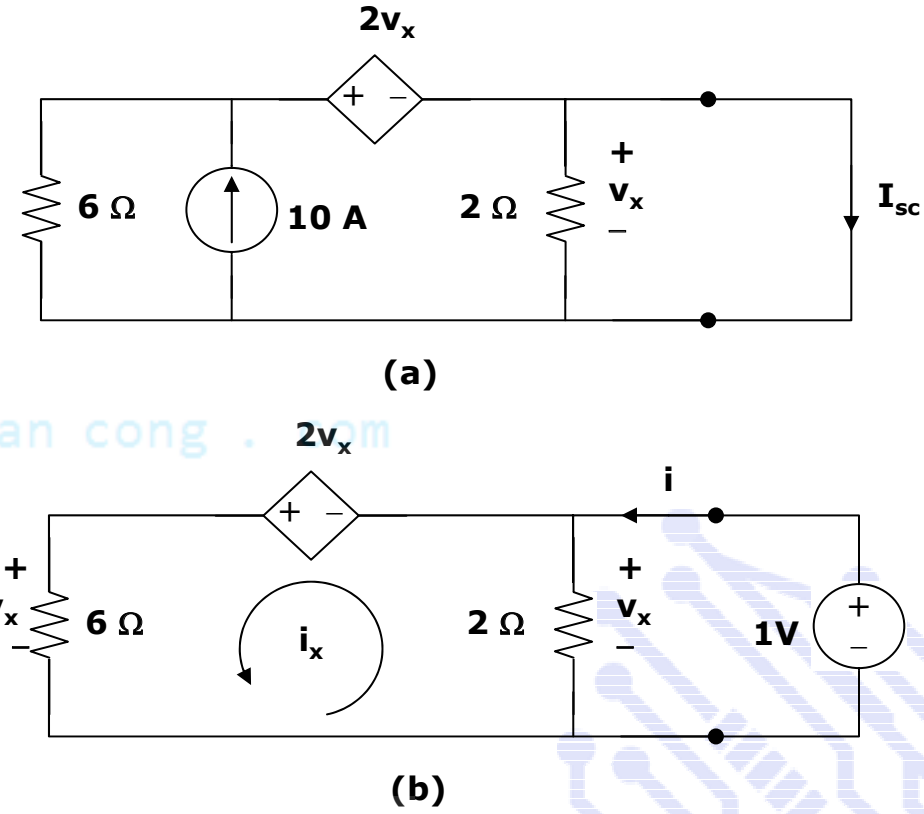
*Refer to in-class illustration,textbook, answer U_{oc} = 5.33V,

R_{TH} = 3Ω

❖Example3: Thevenin-Norton Circuit

Find the Norton equivalent circuit of the circuit shown below.



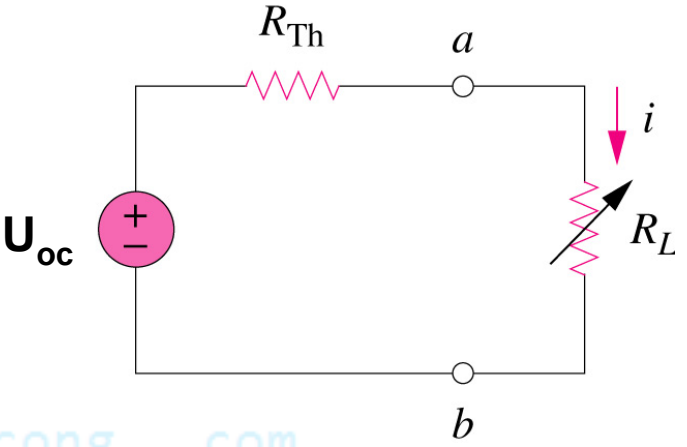


*Refer to in-class illustration, textbook, $R_N = 1\Omega$, $I_N = 10A$.

❖App: Maximum Power Transfer

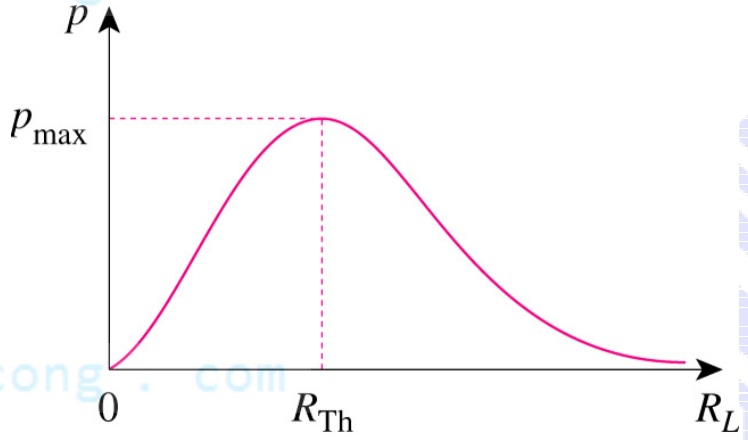
- If the entire circuit is replaced by its Thevenin equivalent except for the load, the power delivered to the load is:

$$P = i^2 R_L = \left(\frac{U_{oC}}{R_{Th} + R_L}\right)^2 R_L$$



- For maximum power dissipated in R_L, P_{max}, for a given R_{TH} and U_{oc} :

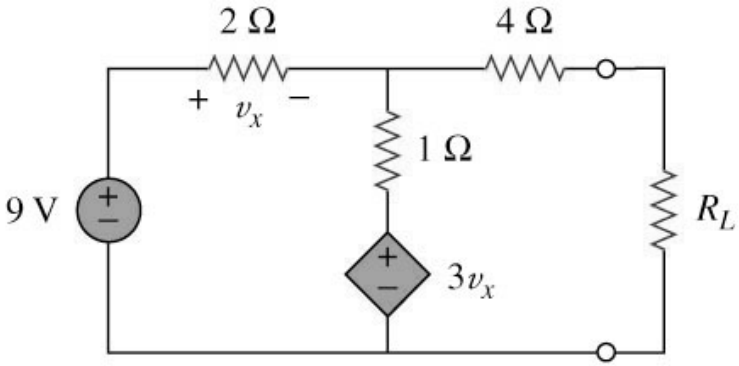
$$R_L = R_{TH} \Rightarrow P_{max} = \frac{U_{oc}^2}{4R_L}$$

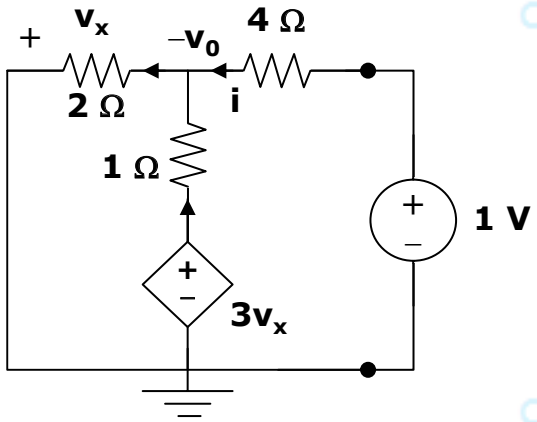


The power transfer profile with different R_L

❖Example: Maximum Power Transfer

Determine the value of R_L that will draw the maximum power from the rest of the circuit shown below. Calculate the maximum power.





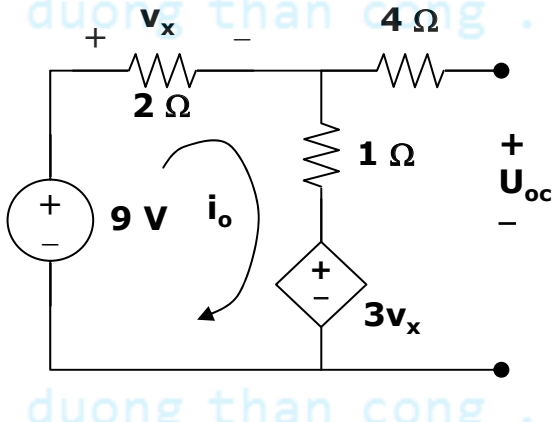


Fig. a:

=> To determine R_{TH}

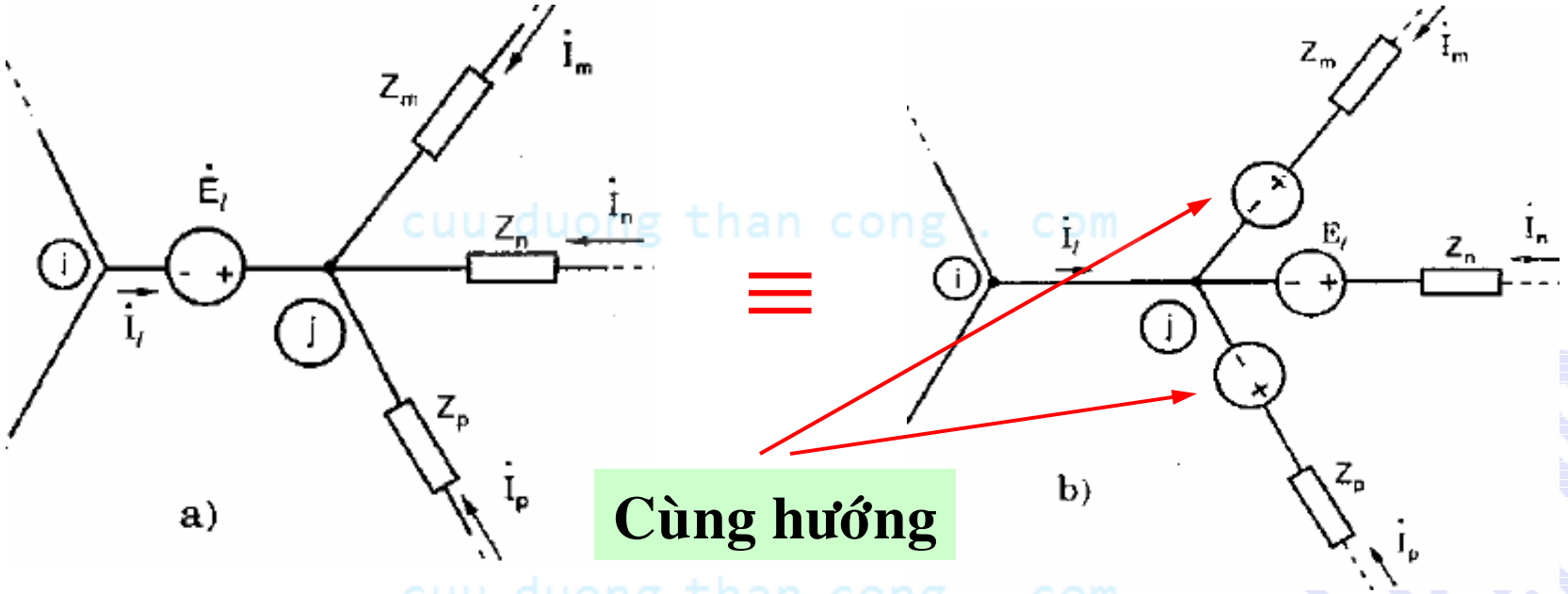
Fig. b:

=> To determine U_{oc}

*Refer to in-class illustration, textbook, $R_L = 4.22\Omega$, $P_m = 2.901W$

3.6.4 Định lý chuyển vị nguồn :

a) Chuyển vị nguồn áp:

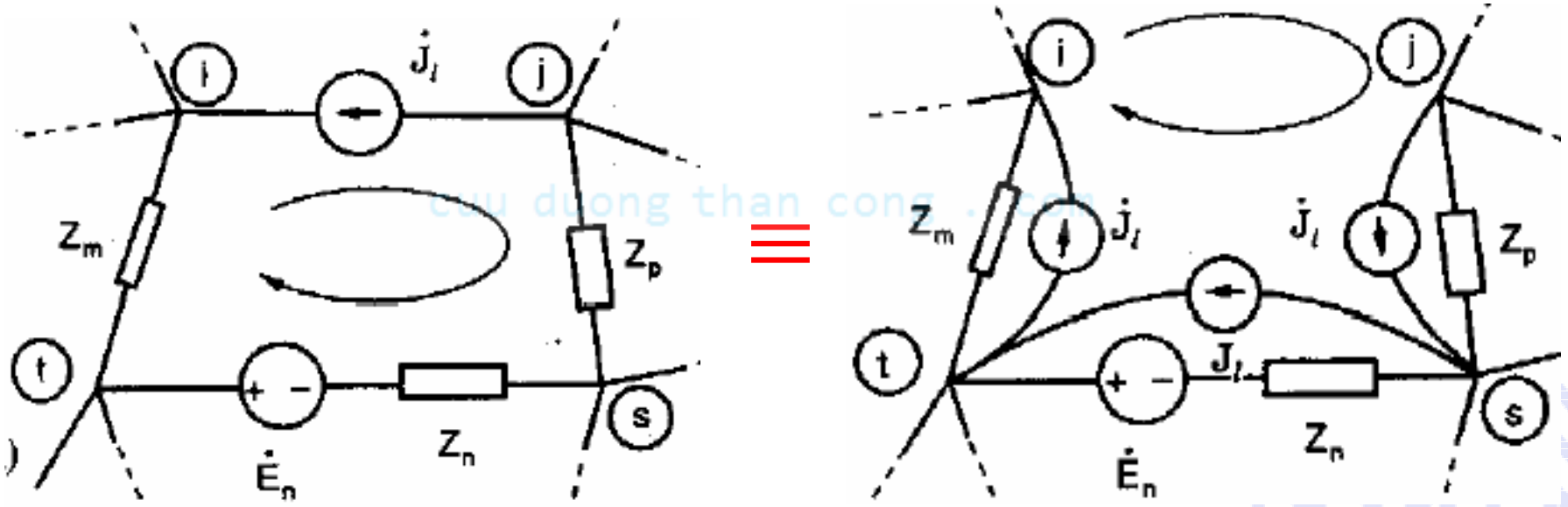


Cùng hướng

Chứng minh dựa trên các luật KVL được bảo toàn cho các mắc lưới .

3.6.4 Định lý chuyển vị nguồn (tt):

b) Chuyển vị nguồn dòng:



Chứng minh dựa trên các luật KCL được bảo toàn cho các nút { i, j, s, t } .