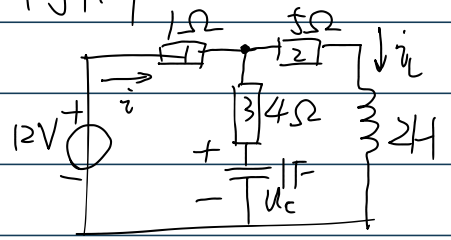
第一二章例题

Sunday, September 3, 2023 12:54 AM

例1.1 计算 i_L, u_C, i 以及存储在 C, L 中能量。



解：$U = i_L \cdot (R_1 + R_2)$ 由于电感对直流导通

$\therefore i_L = \frac{12}{6} = 2A$

$\therefore U_{3右} = IR = 10V$,

而：$U_C = U_3 = 10V$,

$i = i_L = 2A$.

电容储能：$Q = CU$

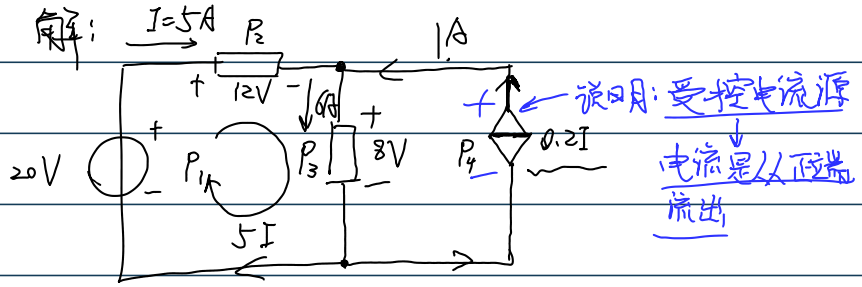
$= 10(C)$

→ 有储存能量 $W_C = \frac{1}{2}CU^2 = \frac{1}{2} \times 1 \times 10^2 = 50(J)$

右系链公式：$\psi = L \cdot i = 4(Wb)$

$W_L = \frac{1}{2}Li^2 = 4(J)$

例1.2 计算各元件发出或吸收的功率



解：$P_2 = (+1)(+1)\,UI = 60(W)$（吸收）

$P_3 = (+1)(+1)\,UI = 48(W)$（吸收）

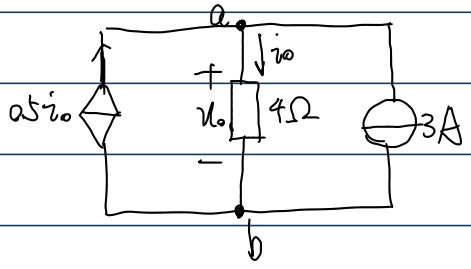
$P_1 = (-1)(-1)\,UI = 100(W)$（发出）

对 P_4：是 CCCS，从而有：$i = 0.2I = 1A$.

而U与P_3相同为8V，$\therefore$

$P_4 = (-1)(-1)\,UI = 8(W)$（发出）.

2-2. 求 i_0, u_0



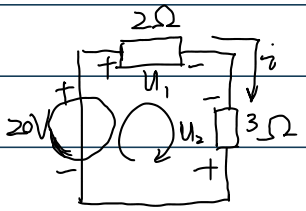
由：a：$3A + 0.5i_0 = i_0$

得：$i_0 = 6A$.

由欧姆定律：$U = i_0 R = 24(V)$

（选用关联参考方向）.

2-3. 求 U_1、U_2　　取回路顺时针正



解：由 KVL 定律：$U_1 - U_2 - U_S = 0$

↑ 电压和参考(顺时针)方向对应则负

$\therefore U_1 - U_2 - 20 = 0$，

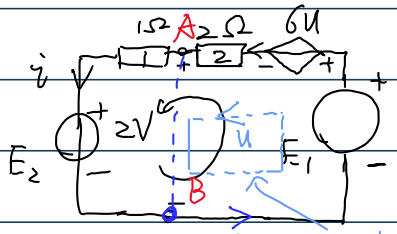
由欧姆定律：$U_1 = 2i$，$U_2 = -iR_2$　　注意符号问题

两段一次方向，

$\therefore 2i + 3i - 20 = 0$　$\therefore 5i = 20$，$i = 4$(A)

$\therefore U_1 = 8$(V)　$U_2 = -12$V，

例2-4. 如图电路，求 i、U 以及各个独立电源和受控源产生的功率



取逆时针为回路绕行方向，

10V 则：$6U + U_2 + U_1 + 2 - 10 = 0$　①

无节点电流 → $U_1 = iR_1$，$U_2 = iR_2$

(要注意：其中 U 的含义：从 B→A 所跨的电压升高为 U，

则：$10 - 6U - 2 = i(1+2)$　①

左：电压↑

又：$2i + 6U - 10 = -U$　(以顺时针加)

从低压升高为正，降低为负，由正到负数电压降低 U

$2i = 10 - 7U$　②　注意：更简便是用左边，直接 $1 \cdot i + 2 = U$　②

$\begin{cases} 8 - 6U = 3i \\ 10 - 7U = 2i \end{cases} \rightarrow \begin{cases} 16 - 12U = 6i \\ 30 - 21U = 6i \end{cases}$　也符合 $i + 2 = U$，

$\rightarrow (30-16) - (21-12)U = 0$

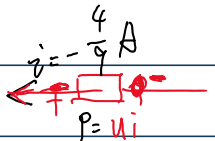
$14 - 9U = 0$　$U = \frac{14}{9}$(V)　$i = \frac{8}{3} - \frac{28}{9} = -\frac{4}{9}$(A)

受控电压源 $V = \frac{14}{9} \times 6 = \frac{28}{3}$(V)

且 $P_{放} = (-1) \cdot (+1) \cdot \frac{28}{3} \cdot (-\frac{4}{9}) = \frac{112}{27}$(W)(放)　关联

对 E_1，$P_{吸} = (+1) \cdot (-1) \cdot 10 \times -\frac{4}{9} = \frac{40}{9}$(W)(吸)

E_2，$P_{放} = (+1)(-1) \cdot 2 \cdot -\frac{4}{9} = \frac{8}{9}$(W)(放)



$\therefore \frac{112}{27} + \frac{8}{9} - \frac{40}{9} - \frac{16}{81} - \frac{32}{81}$　← 对于电阻 功率总回收 $= (-1)(+\frac{32}{81})$

别用 U，用 i^2R，

$= \frac{136}{27} - \frac{40}{9} - \frac{16}{27} = 0$　✓