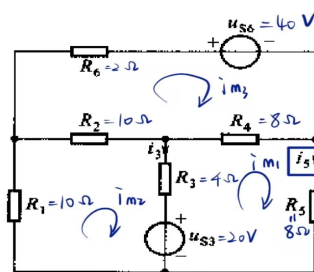


电路第三章作业

自实陈嘉宇 U202414389

3-8

用网孔电流法求图中电流 i_5



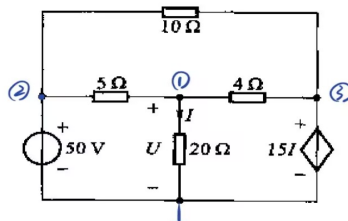
解:

$$\begin{bmatrix} 20 & -4 & -8 \\ -4 & 24 & -10 \\ -8 & -10 & 20 \end{bmatrix} \begin{bmatrix} i_{m1} \\ i_{m2} \\ i_{m3} \end{bmatrix} = \begin{bmatrix} 20 \\ -20 \\ -40 \end{bmatrix} \Rightarrow \begin{bmatrix} i_{m1} \\ i_{m2} \\ i_{m3} \end{bmatrix} = \begin{bmatrix} -0.956 \\ -2.507 \\ -3.636 \end{bmatrix}$$

故 $i_5 = i_{m1} = -0.956A$.

3-21

用节点电压法求图中电压 U



题 3-21 图

解: $u_{n2} = 50V, u_{n3} = 15I$, 且有 $I = 0.05u_{n1}$

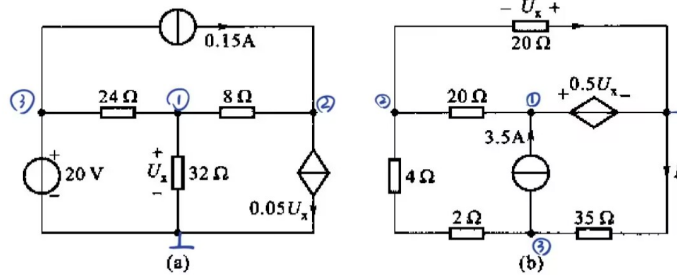
对节点 1:

$$0.5u_{n1} - 0.2u_{n2} - 0.25u_{n3} = 0$$

$$\Rightarrow U = u_{n1} = 20.3V$$

3-22

用节点电压法求图 (a) 中的 U_x 和图 (b) 中的 I



(a) 解: $u_{n2} = 30V, u_{n1} = U_x$

对 Node1:

$$\left(\frac{1}{24} + \frac{1}{8} + \frac{1}{32}\right)u_{n1} - \frac{1}{8}u_{n2} - \frac{1}{24}u_{n3} = 0$$

对 Node2:

$$\frac{1}{8}u_{n2} - \frac{1}{8}u_{n1} = 0.15 - 0.05U_x$$

解得:

$$U_x = 8V$$

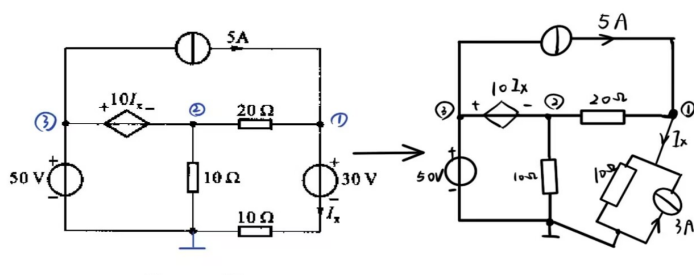
(b) 解: $u_{n1} = 0.5U_x, u_{n2} = -U_x$

$$\begin{cases} (\frac{1}{6} + \frac{1}{35})u_{n3} - \frac{1}{6}u_{n2} = -3.5 \\ (\frac{1}{6} + \frac{1}{20} + \frac{1}{20})u_{n2} - \frac{1}{20}u_{n1} - \frac{1}{6}u_{n3} = 0 \end{cases}$$

$$\Rightarrow I = 1A$$

3-23

用节点电压法求图中电路 I_x 以及 ccvs 的功率



解: $u_{n3} = 50V, u_{n2} = 50 - 10I_x$

node1:

$$(\frac{1}{20} + \frac{1}{10})u_{n1} - \frac{1}{20}u_{n2} = 5 + 3$$

另有:

$$\frac{u_{n1}}{10} - 3 = I_x$$

$$\Rightarrow I_x = 3A, u_{n1} = 60V$$

于是 $u_{n2} = 20V$, 对 node 2 用 KCL:

$$\frac{60V - 20V}{20\Omega} = \frac{20V}{10\Omega} + I_{CCVS}$$

$$\Rightarrow I_{CCVS} = 0 \Rightarrow P_{CCVS} = 0$$