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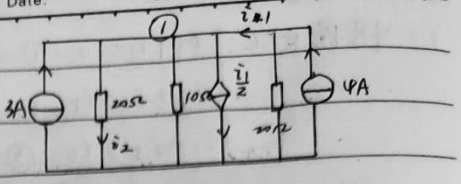
3-7 电路可变换为：



对结点①列方程：

$\left(\frac{1}{20}+\frac{1}{10}+\frac{1}{20}\right)u_1 = 3+4-\frac{i_1}{2}$

$\Rightarrow u_1 = 35-\frac{5}{2}i_1$

对于20Ω电阻，有 $\begin{cases}(i_1-4)\cdot 20 = -u_1 \\ 20i_2 = u_1\end{cases}$

$\Rightarrow i_1 = \frac{15}{7}A = 2.57A$，$i_2 = \frac{10}{7}A = 1.43A$

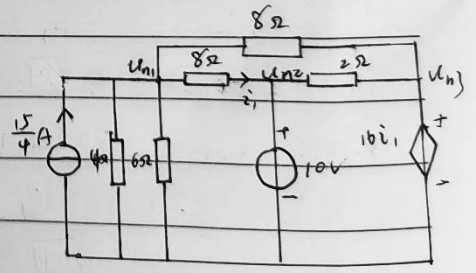
3-11 将戴维南支路变换为诺顿支路可得：

$$\begin{cases}\left(\frac{1}{1}+\frac{1}{8}\right)u_{n1}-\frac{1}{1}u_{n3} = 10-4 \\ \frac{1}{2}u_{n2} = 4-2i_1 \\ -\frac{1}{1}u_{n1}+\left(\frac{1}{4}+\frac{1}{1}\right)u_{n3} = 2i_1-10 \\ i_1 = (i_1+10)\cdot 1 = u_{n1}-u_{n3}\end{cases}$$

$\Rightarrow u_{n1} = -16V$，$u_{n2} = -16V$，$u_{n3} = -24V$，$i_1 = -2A$

故经过参考结点的电流为 $\frac{u_{n1}}{8}+\frac{u_{n2}}{2}+\frac{u_{n3}}{4} = 0$，正确

3-14 变换电路并列结点方程：



$$\begin{cases}\left(\frac{1}{4}+\frac{1}{6}+\frac{1}{8}+\frac{1}{8}\right)u_{n1}-\frac{1}{8}u_{n2}-\frac{1}{8}u_{n3} = \frac{15}{4} \\ u_{n2} = 10 \\ u_{n3} = 16i_1 \\ u_{n1}-u_{n2} = 8i_1\end{cases}$$

$\Rightarrow i_1 = -0.5A$，$u_{n1} = 6V$，$u_{n2} = 10V$，$u_{n3} = -8V$

经过参考结点电流为：$-\frac{15}{4}+\frac{u_{n1}}{4}+\frac{u_{n1}}{6}+i_1-\frac{u_{n2}-u_{n3}}{2}+\frac{u_{n1}-u_{n3}}{8}+\frac{u_{n2}-u_{n3}}{2} = 0$

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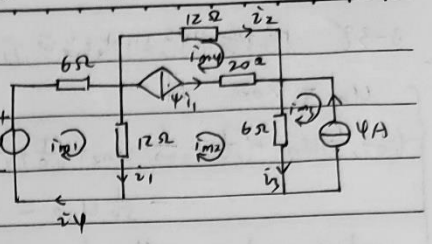
3-28 列网孔方程得：



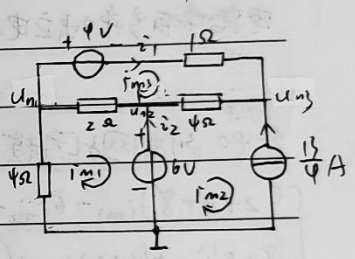
$$\begin{cases}(6+12)i_{m1}-12i_{m2}=144\\ -12i_{m1}+(12+6)i_{m2}-6i_{m3}+12i_{mφ}=0\\ i_{m3}=-φA\\ i_{m2}-i_{mφ}=φi_1\end{cases}$$

代入 $i_{m1}-i_{m2}=i_1$ 得：$i_{m1}=16A$，$i_{m2}=12A$，$i_{m3}=-φA$，$i_{mφ}=-φA$

$\Rightarrow i_1=φA$，$i_2=i_{mφ}=-φA$，$i_3=i_{m2}-i_{m3}=16A$，$i_φ=i_{m1}=16A$

最佳选择网孔方程，因为有 i_{m3} 可直接由电流源支路确定

3-30 列出网孔方程



$$\begin{cases}(φ+2)i_{m1}-2i_{m3}=-6\\ i_{m2}=-\frac{13}{φ}A\\ -2i_{m1}-φi_{m2}+(2+1+φ)i_{m3}=-φ\end{cases}$$

$\Rightarrow i_{m2}=-2A$，$i_{m2}=-\frac{13}{φ}A$，$i_{m3}=-3A$

$\Rightarrow i_1=i_{m3}=-3A$，$i_2=-i_{m1}+i_{m2}=-1.25A$

$u_{n3}=u_{n2}-(i_{m2}-i_{m3})\cdot φ=7V$

$P_1=φi_1u_1=-12W$，$P_2=-u_2i_2=7.5W$，$P_3=-u_3i_3=-22.75W$

最佳选择为网孔方程，因为可直接得到 u_{n2} 和 i_{m2}，且计算功率时易算出两个电压源支路的电流。

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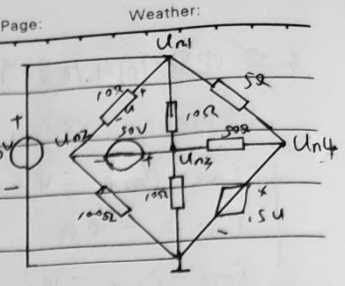
3-38 根据电路列出结点方程：



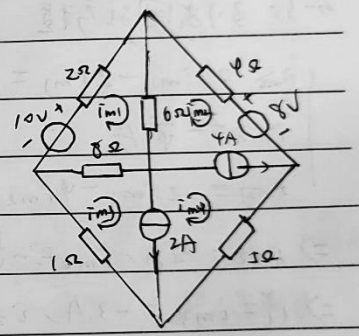
$$\begin{cases} u_{n1} = 100 \\ -\left(\frac{1}{10}+\frac{1}{5}\right)u_{n1}+\left(\frac{1}{10}+\frac{1}{100}\right)u_{n2}+\left(\frac{1}{10}+\frac{1}{10}+\frac{1}{50}\right)u_{n3} \\ \qquad -\frac{1}{50}u_{n4}=0 \\ -\frac{1}{5}u_{n1}-\frac{1}{50}u_{n3}+\left(\frac{1}{5}+\frac{1}{50}\right)u_{n4}=0 \end{cases}$$

代入 $\begin{cases} u_{n1}-u_{n2}=U,\ u_{n4}=1.5U \text{ 可得：} \\ u_{n3}-u_{n2}=50 \end{cases}$

$\Rightarrow U=\frac{800}{21}=38.10\ V$

电路中有多条独立电压源支路，利于减少结点方程数，且网孔太多

3-40 列出网孔方程：



$$\begin{cases} (2+6+8)i_{m1}-6i_{m2}-8i_{m3}=10 \\ -(8+6)i_{m1}+(4+6)i_{m2}+(8+1)i_{m3}+5i_{m4}=-8 \\ i_{m4}-i_{m2}=4 \\ i_{m3}-i_{m4}=2 \end{cases}$$

$\Rightarrow i_{m1}=\frac{61}{47}\ A,\ i_{m2}=-\frac{25}{47}\ A,\ i_{m3}=\frac{157}{47},\ i_{m4}=\frac{63}{47}$

$\Rightarrow i_1=i_{m1}=\frac{61}{47}=1.30\ A,\ i_2=i_{m2}=-\frac{25}{47}=-2.66\ A,$

$i_3=i_{m4}=1.34\ A,\ i_4=i_{m3}=3.34\ A,\ i_5=i_{m3}-i_{m1}=2.04\ A$

$i_6=i_{m2}-i_{m1}=-\frac{186}{47}=-3.96\ A$