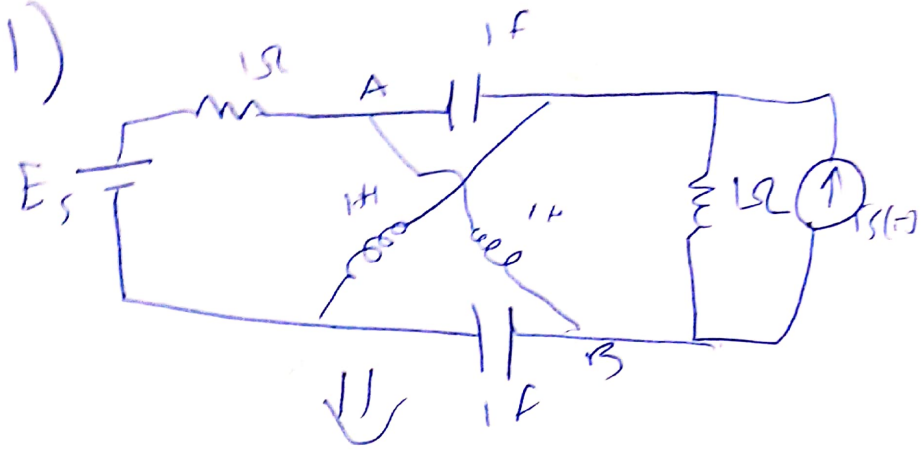
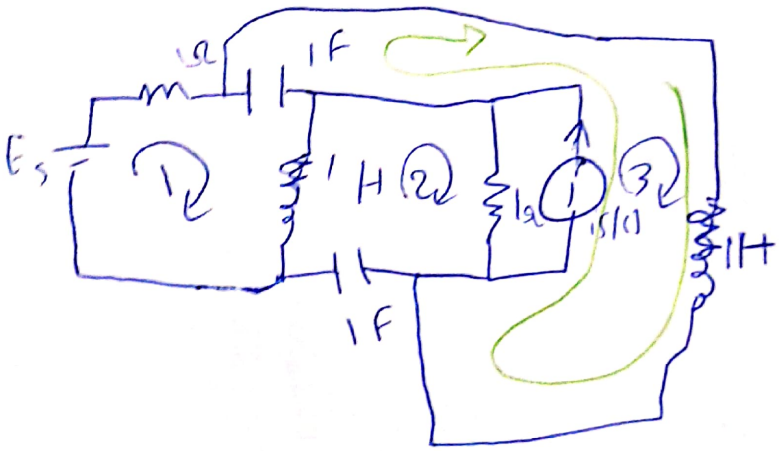
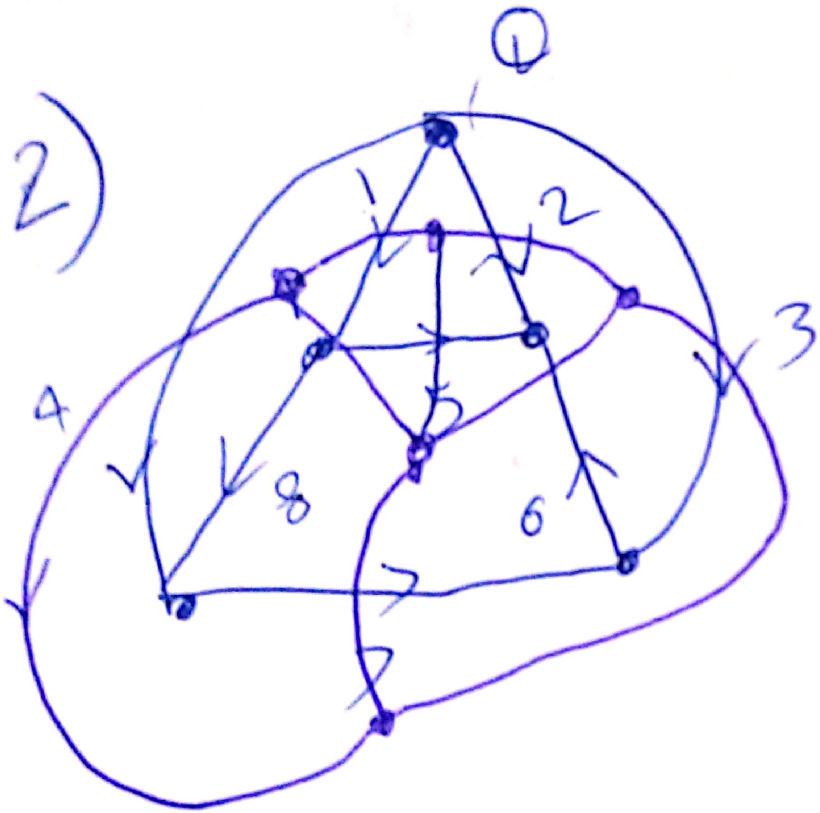
1)





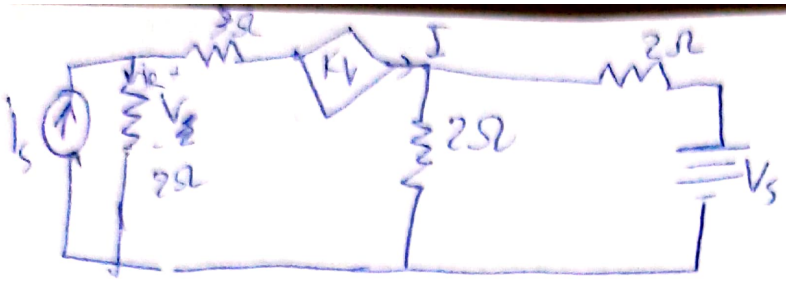
$$
\begin{matrix} \textcircled{1} \\ \textcircled{2} \\ \textcircled{3} \end{matrix}
\begin{bmatrix}
1+\frac{1}{D}+D & -D & \frac{-1}{D} \\
-D & 1+D+\frac{1}{D} & -1 \\
\frac{-1}{D} & -1 & 1+\frac{1}{D}+D
\end{bmatrix}
\begin{pmatrix} i_1 \\ i_2 \\ i_3 \end{pmatrix}
=
\begin{pmatrix} E_s \\ -i_{s(1)} \\ i_{s(1)} \end{pmatrix}
$$

2)



⇒

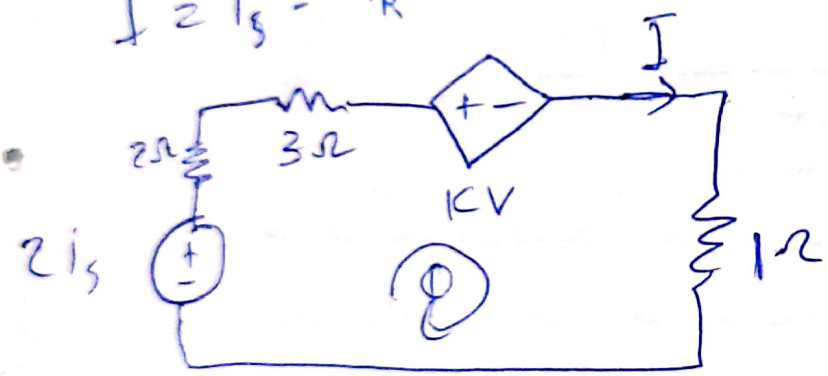
3)



V_s را انتقال کوتاه می بینیم

سپس i_s را به منبع ولتاژ تبدیل می کنیم

$I = i_s - i_R$



$KVL\ ① : +2i_s - 2I - 3I - KV - I = 0 \Rightarrow$

$V = \frac{2}{3}I \Leftarrow i_s = -\frac{4}{3}I \Leftarrow V = \frac{1}{2}i_s$ و فرض صورت مسئله $V = 2i_R = 2(-I + i_s)$ ① با توجه به جریان

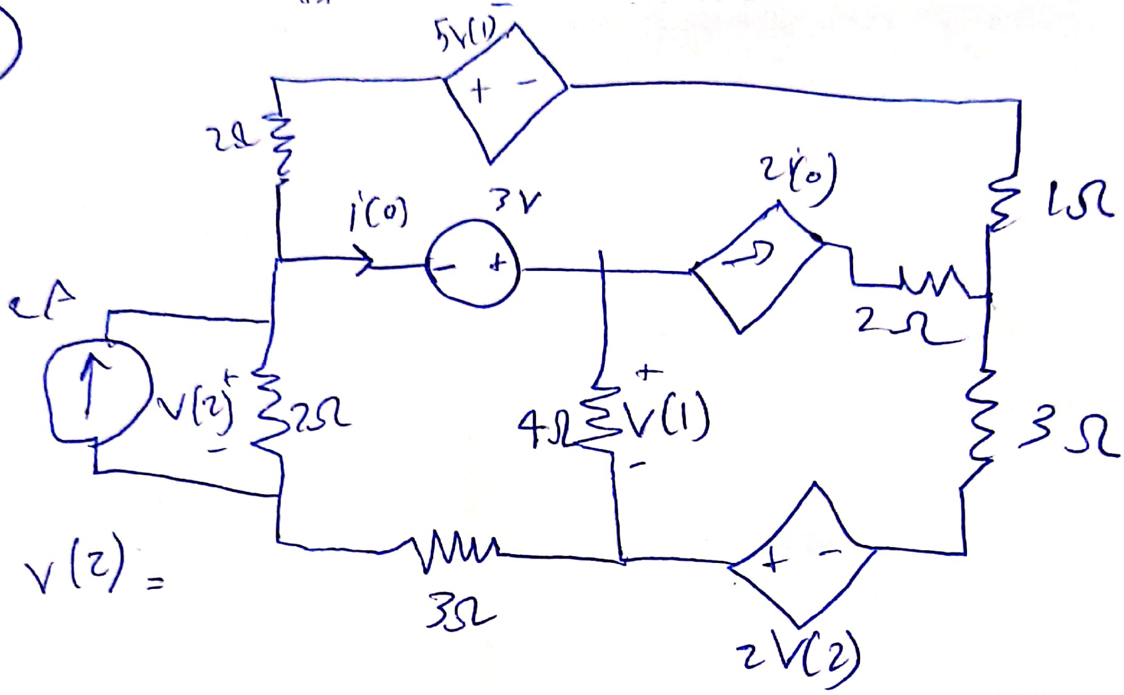
$\Rightarrow 2i_s - 6I + 2IK - 2i_s K = 0 \Rightarrow (6 - 2K)I = 2i_s(1 - K)$

$\frac{8}{3}I$

$18 - 6K = 8 - 8K$

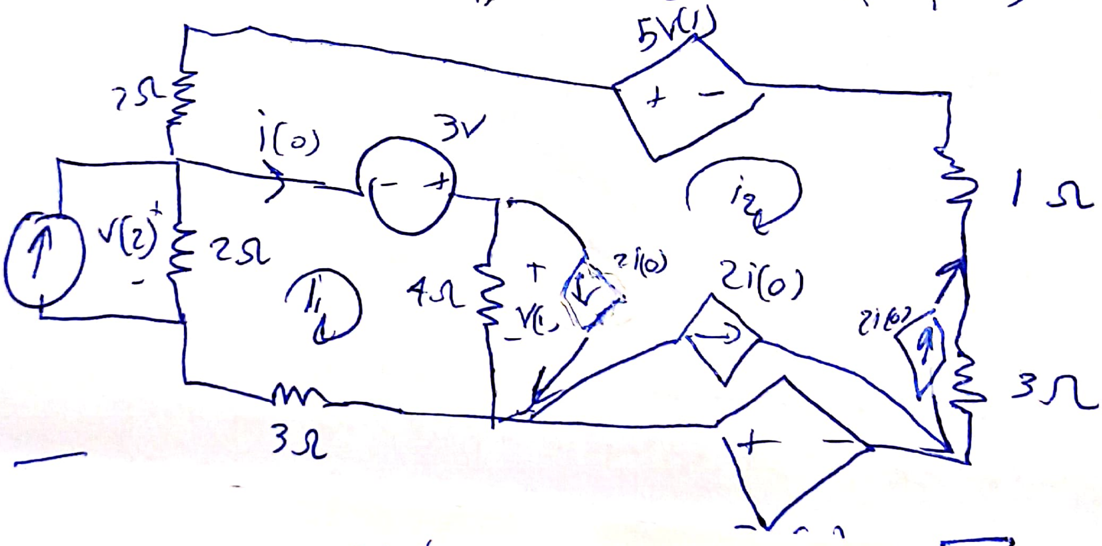
$10 = -2K \Rightarrow K = -5$

4)

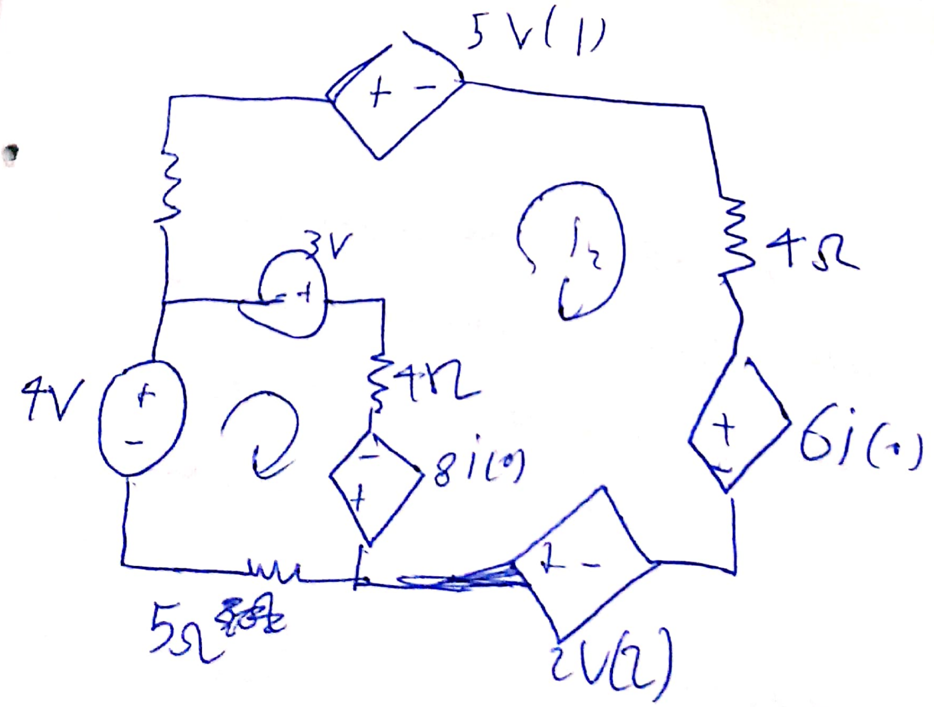


$v(2) =$

مقاومت دو اهم حذف و منبع جریان را پخش می‌کنیم



$Z_n I = E_s$



$i(0) = i_1 - i_2$

$V(1) = 4(i_1 - i_2)$

$V_3(2) = 2(i_1 - 2)$

$$\begin{bmatrix} 4+3+2 & -4 \\ -4 & 4+2+1+3 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} 4+3+8(i_1-i_2) \\ 4(i_1-2)-6(i_1-i_2) \\ -20(i_1-i_2) \\ -3-8(i_1-i_2) \end{bmatrix}$$

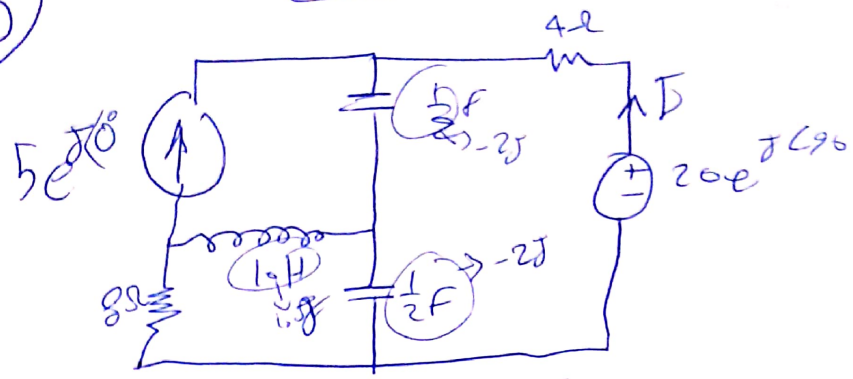
$$\begin{bmatrix} 9 & -4 \\ -4 & 10 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} 7+8(i_1-i_2) \\ -30i_1+34i_2-11 \end{bmatrix}$$

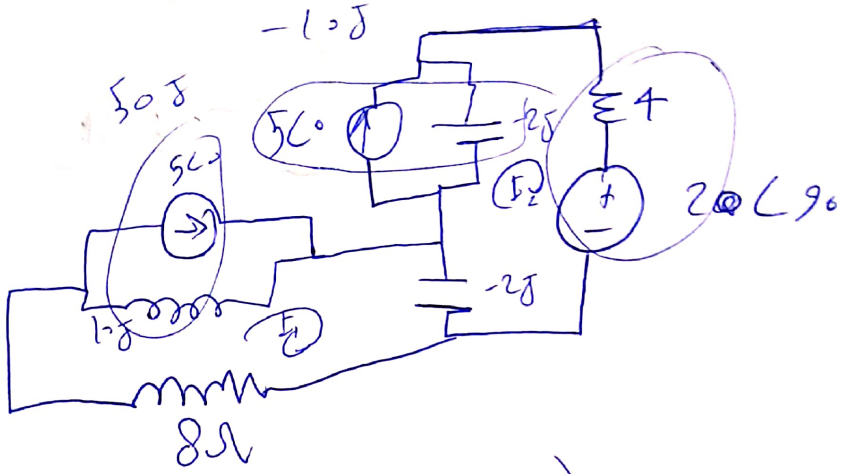
$$\begin{bmatrix} 1 & 4 \\ +26 & -24 \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} 7 \\ -11 \end{bmatrix}$$

$$\begin{bmatrix} i_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} \frac{3}{16} & \frac{1}{32} \\ \frac{13}{64} & -\frac{1}{128} \end{bmatrix} \begin{pmatrix} 7 \\ -11 \end{pmatrix} \begin{cases} i_1 = \frac{31}{32} \\ i_2 = \frac{193}{128} \end{cases}$$

5)

$\omega = 1$





$$\begin{pmatrix} 8+8j & 2j \\ 2j & 4-4j \end{pmatrix}\begin{pmatrix} I_1 \\ I_2 \end{pmatrix} = \begin{pmatrix} 50j \\ -20j+(-10j) \\ -30j \end{pmatrix}$$

$$\begin{pmatrix} I_1 \\ I_2 \end{pmatrix} = \begin{pmatrix} \frac{1}{17} - \frac{i}{17} & -\frac{i}{34} \\ -\frac{i}{34} & \frac{2}{17} + i\frac{2}{17} \end{pmatrix}\begin{pmatrix} 50j \\ -30j \end{pmatrix}$$

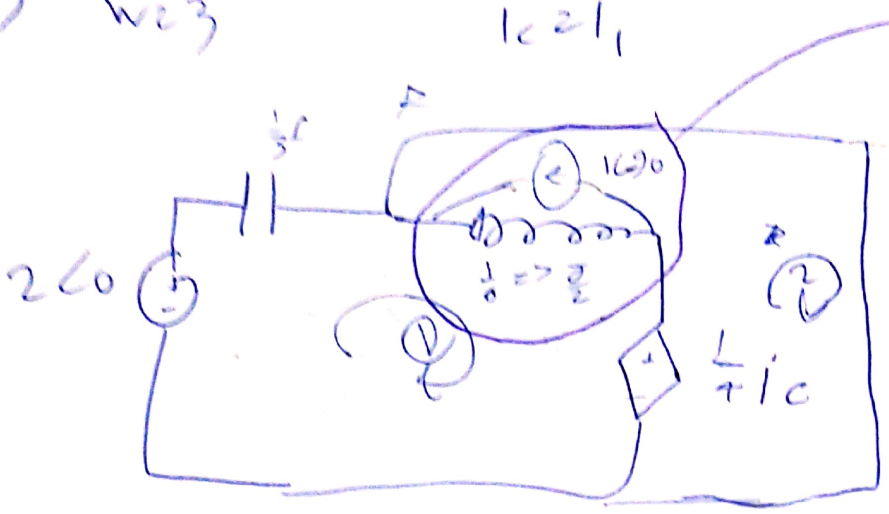
$$I_1 = \frac{35}{17} + i\frac{50}{17}$$

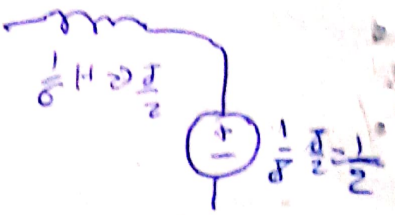
$$I_2 = 5 - i\frac{60}{17} \Rightarrow I = -I_2 = -5 + i\frac{60}{17}$$

$$I = \begin{cases} r = \frac{5\sqrt{433}}{17} = 6.12 \\ -\tan^{-1}\left(\frac{12}{17}\right) = \underline{144.782} \end{cases}$$ الزاوية

6)

$\omega = 3$ $\quad i_c = i_1$





$$\begin{bmatrix} 3 + \frac{1}{2}j & -\frac{3}{2} \\ -\frac{3}{2} & \frac{3}{2} \end{bmatrix} \begin{pmatrix} i_1 \\ i_2 \end{pmatrix} = \begin{bmatrix} 2 + \frac{-i_1}{7} - \frac{1}{2} \\ \frac{i_1}{7} + \frac{1}{2} \end{bmatrix}$$

$$\begin{bmatrix} \frac{1}{2}j + \frac{1}{7} & -\frac{3}{2} \\ -\frac{3}{2} - \frac{1}{7} & \frac{3}{2} \end{bmatrix} \begin{pmatrix} i_1 \\ i_2 \end{pmatrix} = \begin{bmatrix} \frac{3}{2} \\ \frac{1}{2} \end{bmatrix}$$

$$\rightarrow i_1 = 2j = 2e^{i\frac{\pi}{2}} = 2\cos(3t + 90)$$

$$\rightarrow i_2 = 1 + j = \sqrt{2}\, e^{i\frac{\pi}{4}} = \sqrt{2}\cos(3t + 45^\circ)$$