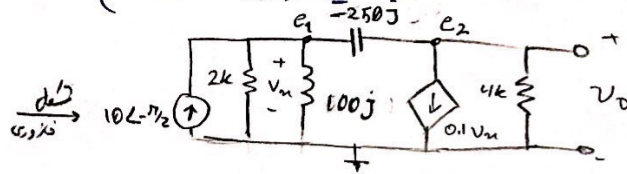


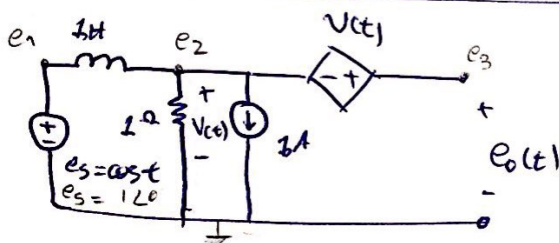
۱- فرقی  $V_0$  را در حالت دائمی حساب کنید. ( $\omega = 2K \text{ rad/s}$ )



$$e_1 = V_x$$

$$e_2 = V_0$$

$$\left. \begin{aligned} e_1) \frac{10j}{-10L-7/2} + \frac{e_1}{2k} + \frac{e_1}{100j} + \frac{e_1 - e_2}{-250j} &= 0 \xrightarrow{\times 2k} -20k + e_1j + 200e_1 + 8(e_2 - e_1) = 0 \\ e_2) \frac{e_2 - e_1}{-250j} + 0.1V_x + \frac{e_2}{2k} &= 0 \xrightarrow{\times 2k} 8(e_1 - e_2) + 200e_1j + e_2j = 0 \end{aligned} \right\} \Rightarrow \dots$$



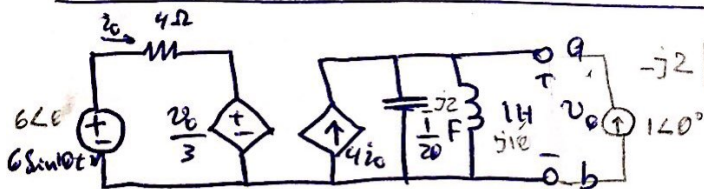
۲- دسدار شکل زیر حالت دائمی  $e_0(t)$  را بدست آورید.

$$e_1 = 1, e_2 = V(t), e_3 = e_0(t), e_3 - e_2 = V(t)$$

$$\Rightarrow e_3 = e_0(t) = 2V(t)$$

$$e_2) \frac{e_2 - e_1}{j} + \frac{e_2}{1} + 1 = 0 \Rightarrow -j(e_2 - e_1) + e_2 + 1 = 0 \Rightarrow -j(V(t) - 1) + V(t) + 1 = 0$$

$$\Rightarrow V(t) = \frac{j+1}{j-1} = -j \Rightarrow e_3 = -2j \Rightarrow e_0(t) = -2j$$



۳- دسدار شکل زیر معادل تونن دیسده از دسر a و b را بدست آورید.

$$v_0 = Z \cdot I = (-j2.5) \times 4i_0 = -j10i_0 \quad \text{I}$$

$$KVL: i_0) -6 + 4i_0 + \frac{v_0}{3} = 0 \quad \text{II}$$

$$\frac{\text{I}, \text{II}}{\Rightarrow i_0 = \frac{6}{4 - j\frac{10}{3}}} \Rightarrow V_{th} = \frac{-j60}{4 - j\frac{10}{3}}$$

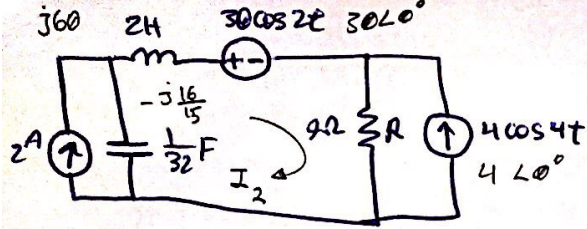
$$V_{th} = V_0 = -j10i_0$$

برای بدست آوردن  $R_{th}$  جریان  $140^\circ$  را به ۰ و قرار داده و منابع متعل را قطع می کنیم:

$$4i_0 + \frac{v_0}{3} = 0 \Rightarrow i_0 = -\frac{v_0}{12} \quad \text{I}$$

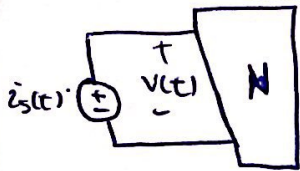
$$1 + 4i_0 = \frac{v_0}{-j2.5} \quad \text{II}$$

$$\left. \begin{aligned} \text{I}, \text{II} \quad v_0 &= \frac{1}{\frac{1}{3} + j0.4} \\ Z_{th} &= \frac{v_0}{1} \end{aligned} \right\} \Rightarrow Z_{th} = \frac{1}{\frac{1}{3} + j0.4}$$



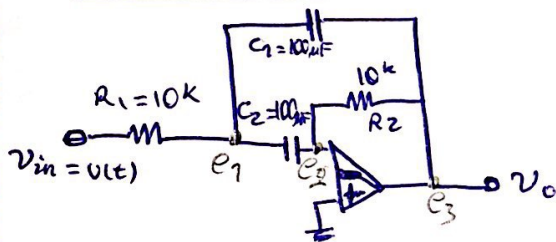
(4) در مدار شکل زیر توان تحویل داده شده به مقاومت R در ولت دایره جفتی است.  
با استفاده از اصل جمع توان :

$$\left\{ \begin{array}{l} 4 \cos 4t : P_{avg} = \operatorname{Re} [R I_{eff}^2] = \operatorname{Re} [9 \times (\frac{4}{\sqrt{2}})^2] = 72 \text{ W} \\ 30 \cos 2t : I_2 = -\frac{30}{-j\frac{16}{15} + j60 + 9} \Rightarrow P_{avg} [9 \times (I_2)^2] = -2.17 \text{ W} \\ 2A : 0 \end{array} \right\} \Rightarrow P_{avg_R} = 69.83 \text{ W}$$



داده شده :  $v = Z \cdot I \rightarrow 3 \angle -3\pi/4 = Z \times 5 \angle 0^\circ \Rightarrow$   
 $\Rightarrow Z = \frac{3}{5} \angle -3\pi/4$  تغییر علامت به معکوس  $\frac{3}{5} \angle -5\pi/4$  (5)  
 دایره جفتی :  $Z(j\omega) = \frac{3}{5} \angle -5\pi/4$  ,  $I = 3 \cos(t + 22.5^\circ) = 3 \angle \pi/8$

$$\Rightarrow v = \frac{2}{5} \angle -\pi/8$$



$$v_1 = v_2 = 0, e_3 = v_o, e_2 = v_3 = 0$$

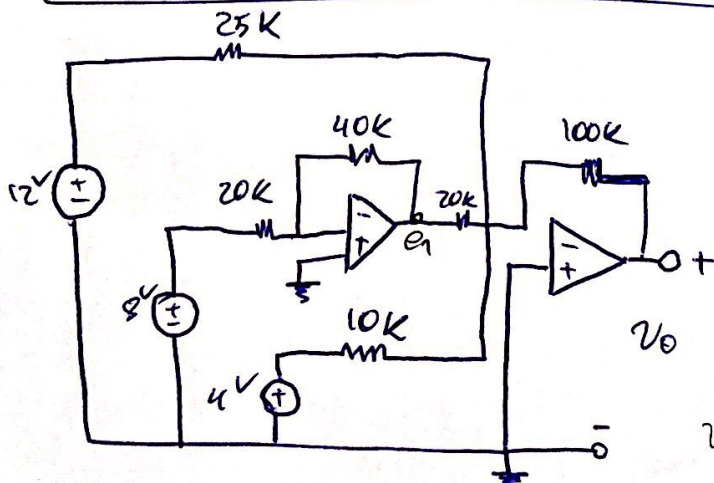
$$e_1) \frac{e_1 - v_{in}}{10K} + 100\mu F \frac{d(e_1 - e_2)}{dt} + 100\mu F \frac{d(e_1 - e_3)}{dt} = 0$$

$$e_2) 100\mu F \frac{d(e_2 - e_1)}{dt} + \frac{e_2 - e_3}{10K} = 0$$

$$\begin{cases} \times 10K \rightarrow e_1) C_1 - v_{in} + \frac{de_1}{dt} + \frac{d(e_1 - e_3)}{dt} = 0 \\ \times 10K \rightarrow e_2) -\frac{de_1}{dt} - e_3 = 0 \Rightarrow e_3 = -\frac{de_1}{dt} \end{cases} \Rightarrow -\frac{d^2 e_1}{dt^2} + 2 \frac{de_1}{dt} + e_1 = U(t)$$

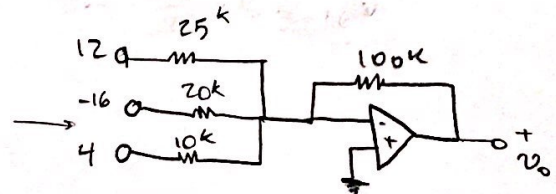
$$\Rightarrow -r^2 + 2r + 1 = 0 \Rightarrow r = 1 \pm \sqrt{2}$$

$$\Rightarrow v_o(t) = a_1 e^{r_1 t} + a_2 e^{r_2 t} \dots$$



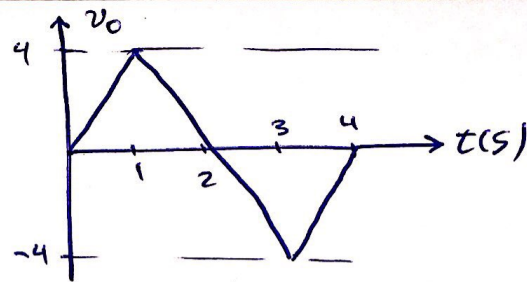
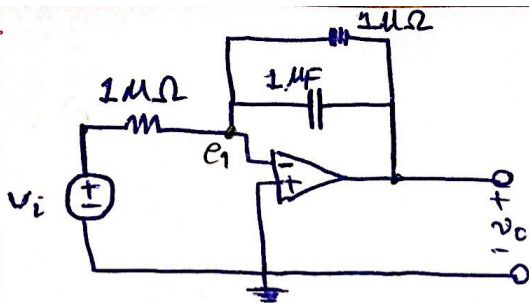
$$e_1 = -\frac{40}{20} \times 8 = -16V$$

$$v_o = ? \quad (7)$$



$$v_o = -\frac{100}{25} \times 12 - \frac{100}{20} \times (-16) - \frac{100}{10} \times 4 = -8V$$





?  $v_i$  , بجز (8

$$e_1 = 0, \quad \text{KCL at } e_1: \frac{e_1 - v_i}{10^6} + \frac{d(e_1 - v_o)}{dt} 10^{-6} + \frac{e_1 - v_o}{10^6} = 0 \quad \times 10^6$$

$$\Rightarrow v_i = -\frac{dv_o}{dt} - v_o$$

