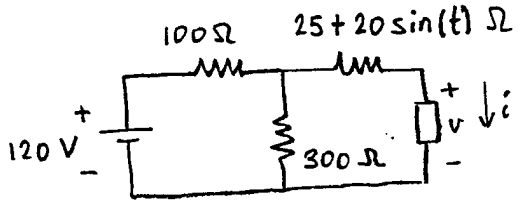
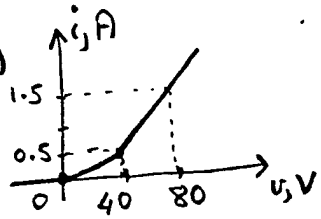
1)



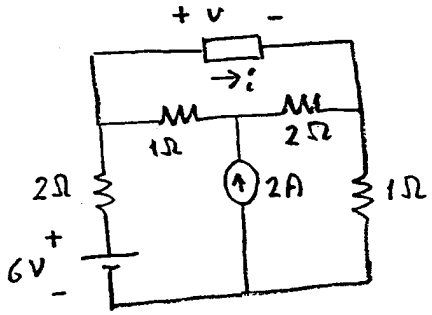
(a) $v = 50i$

(b)



Find i.

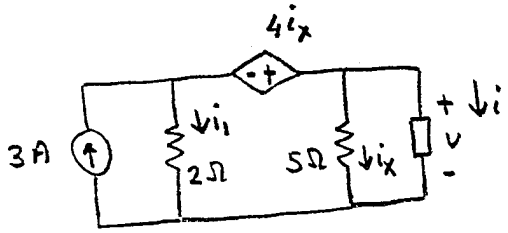
2)

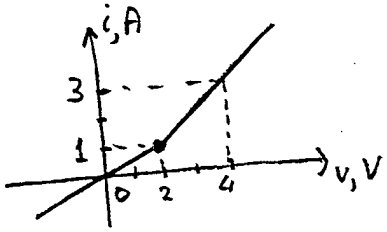


$$i = \begin{cases} v^2, & v \geq 0 \\ 0, & v < 0 \end{cases}$$

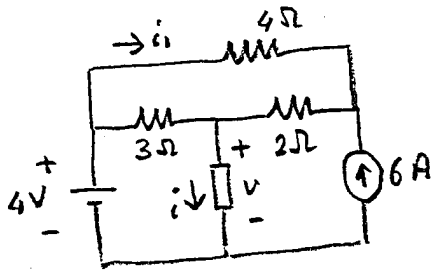
Find the instantaneous powers supplied by/delivered to the independent sources.

3) Find i_1.



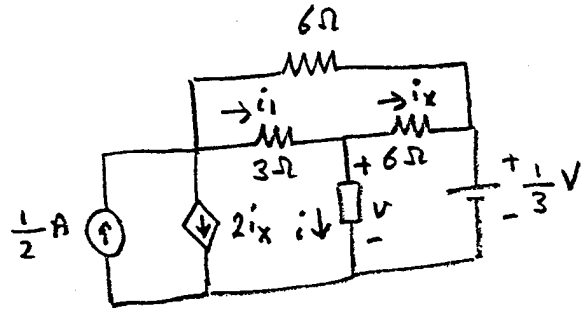


(a)



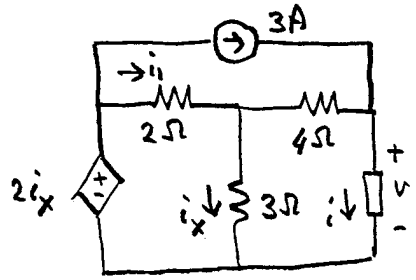
$$v = \begin{cases} 4i^2, & i \geq 0 \\ -4i^2, & i < 0 \end{cases}$$

(b)



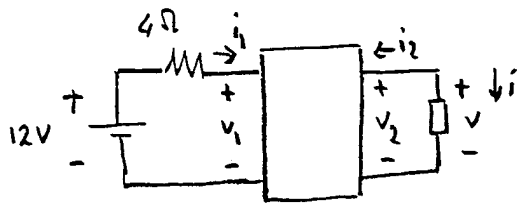
$$i = \begin{cases} \frac{8}{3}v^2, & v \geq 0 \\ 0, & v < 0 \end{cases}$$

(c)

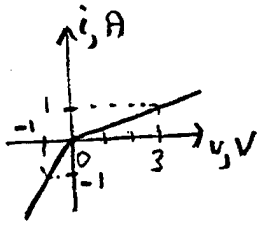


$$i=\begin{cases}\frac{1}{2}v^2+\frac{1}{3}v, & v\geq 0\\ 0, & v<0\end{cases}$$

(d)

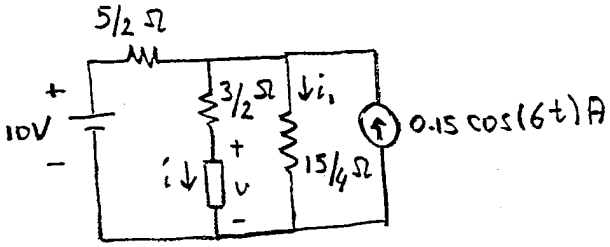


$$\begin{bmatrix}v_1\\ v_2\end{bmatrix}=\begin{bmatrix}4 & 2\\ 2 & 2\end{bmatrix}\begin{bmatrix}i_1\\ i_2\end{bmatrix}$$



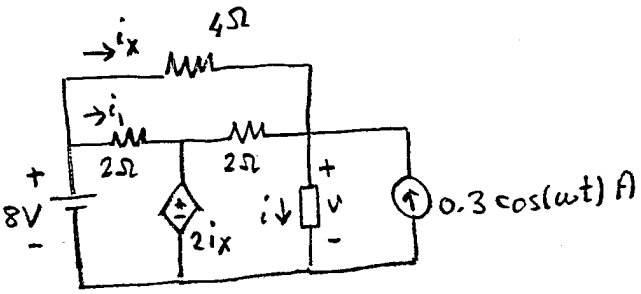
(e)

4) Find i_1.



$$i=\begin{cases}\frac{1}{9}v^2, & v\geq 0\\ 0, & v<0\end{cases}$$

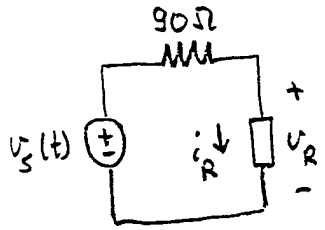
(a)



$$i=\begin{cases}\frac{1}{2}v^2, & v\geq 0\\ 0, & v<0\end{cases}$$

(b)

5)



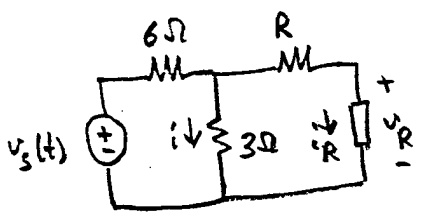
$i_R = 0.5\left(e^{v_R/10}-1\right)$ A

$v_s(t) = V_0 + 0.3\cos(\omega t)$ V

$v_R(t) \simeq V_m + 0.03\cos(\omega t)$ V

Find V_0 and V_m.

6)



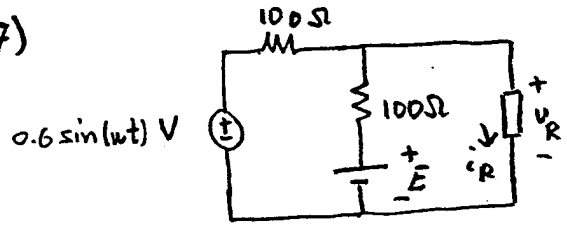
$v_s(t) = 24 + 0.6\cos(\omega t)$ V

$v_R(t) \simeq 2 + V_m\cos(\omega t)$ V

$i_R = \frac{1}{4}v_R^3$

Find R, V_m and i.

7)

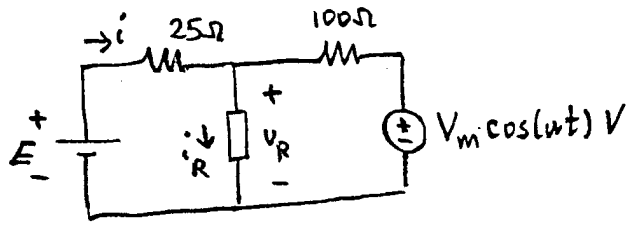


$$i_R = \begin{cases} 0.01\, v_R^2, & v_R > 0 \\ 0, & v_R < 0 \end{cases}$$

$v_R(t) \simeq V_0 + 0.05 \sin(wt)$ V

Find E.

8)

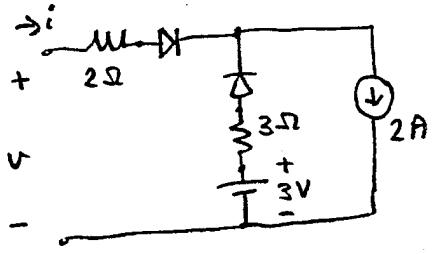


$$i_R = \begin{cases} 0.005\, v_R^2, & v_R \geq 0 \\ 0, & v_R < 0 \end{cases}$$

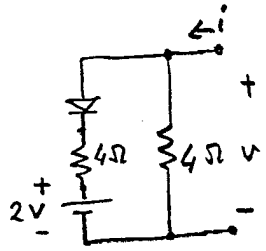
$i(t) \simeq 0.6 + 0.06 \cos(wt)$ A

Find E and V_M.

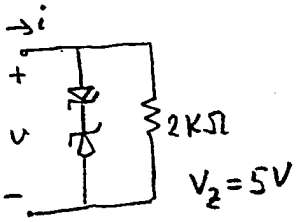
9) Sketch the port characteristics.



(a)

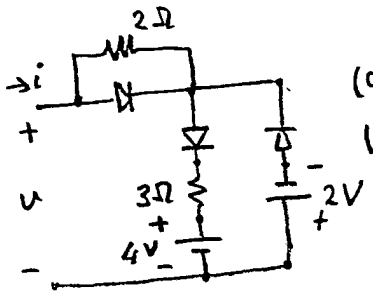


(b)



(c)

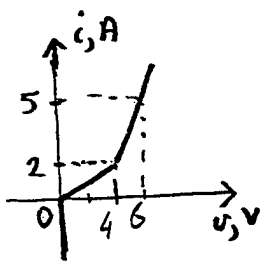
10)



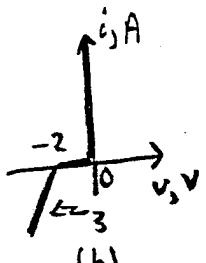
(a) Obtain the port characteristics.

(b) Design a one-port circuit having the same port characteristics using LTI passive resistors, constant independent sources and two ideal diodes.

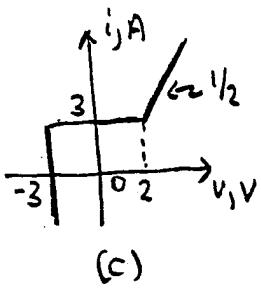
11) Design a one-port circuit realizing the v-i characteristics given below using LTI passive resistors, constant independent sources and ideal diodes.



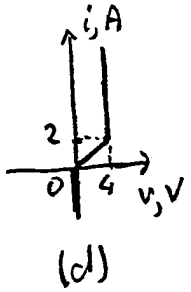
(a)



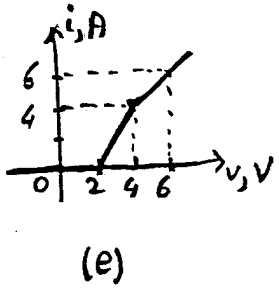
(b)



(c)



(d)



(e)