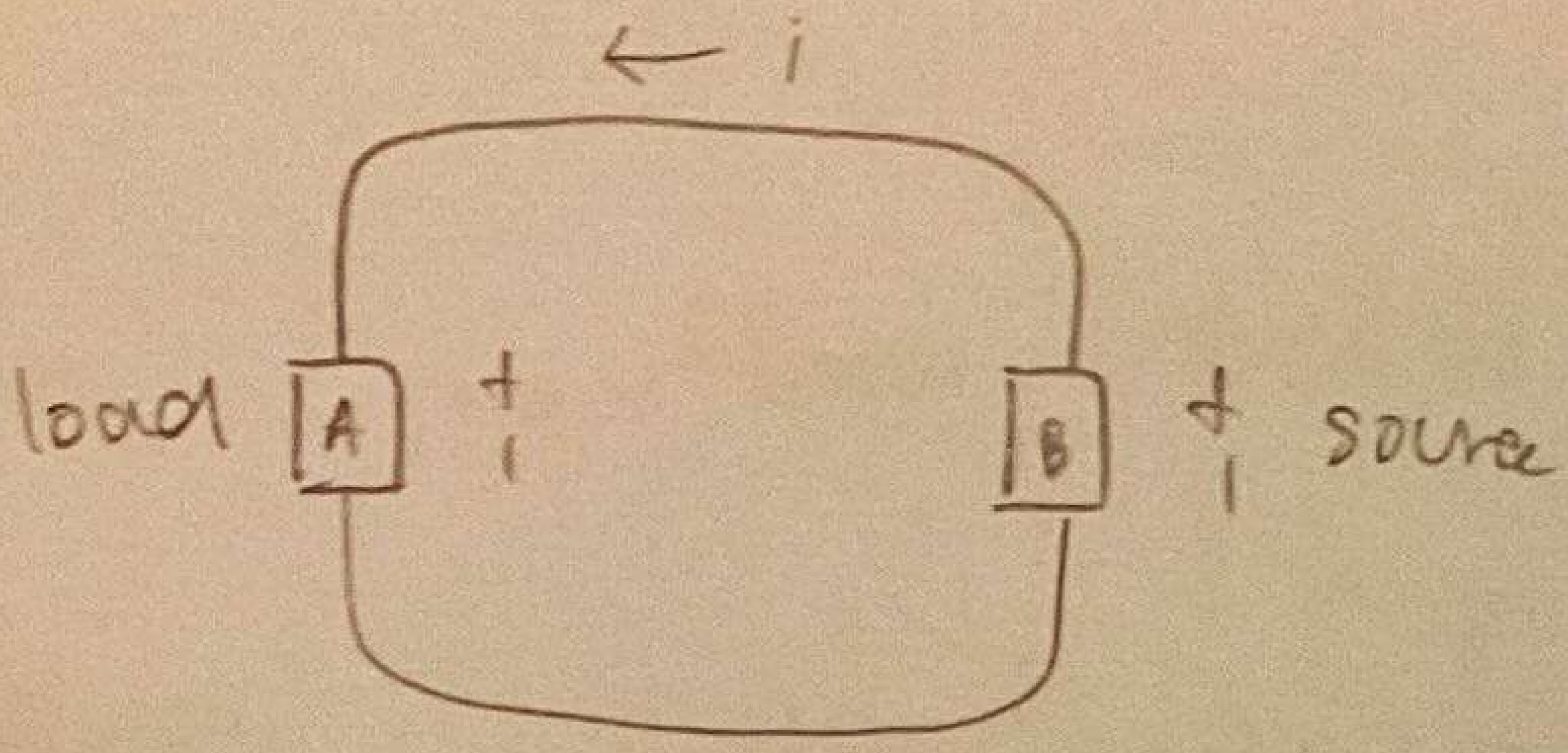
1.

a)



Car A.

b).

p = the rate of which electricity is used or transfer $= VI = 12(30) = 360\ J/s.$

Energy = power × time $= 360 \times 60 = 21600\ J.$

2.

$i = 15te^{-500t}$ $\quad t \geq 0$

$V = 80{,}000te^{-500t}$ $\quad t \geq 0$

$p = 15te^{-500t} \times 8\times10^4 te^{-500t}$

$= 12\times10^5 \times t^2 \times e^{-1000t}$

$= 12\times10^5 \times t^2 e^{-1000T}$

a). $p = VI$

$$\frac{dp}{dt} = 12\times10^5(2te^{-1000t} + t^2e^{-1000t}(-1000))$$

$$= 24\times10^5(te^{-1000t})(1 - t500) = 0$$

$\cancel{t=0}$; $t \geq 0$ $\quad$ $t<0 \quad p=0$

$-10^3(2\times10^{-3})$ $\quad t = \frac{1}{500} = \frac{2}{1000} = 0.002$ sec.

(b)

$$p(2\times10^{-3}) = 12\times10^5 \times (2\times10^{-3})^2 (e^{-1000(2\times10^{-3})})$$

$$= 48\times10^{-1}(e^{-2}) = \frac{48}{10e^2} = 0.65 \text{ Watt}$$

3. absorbed

(a) $P = -(1)(2) = -2$ watt

$500 \times 10^{-3} = 0.5$

(b)

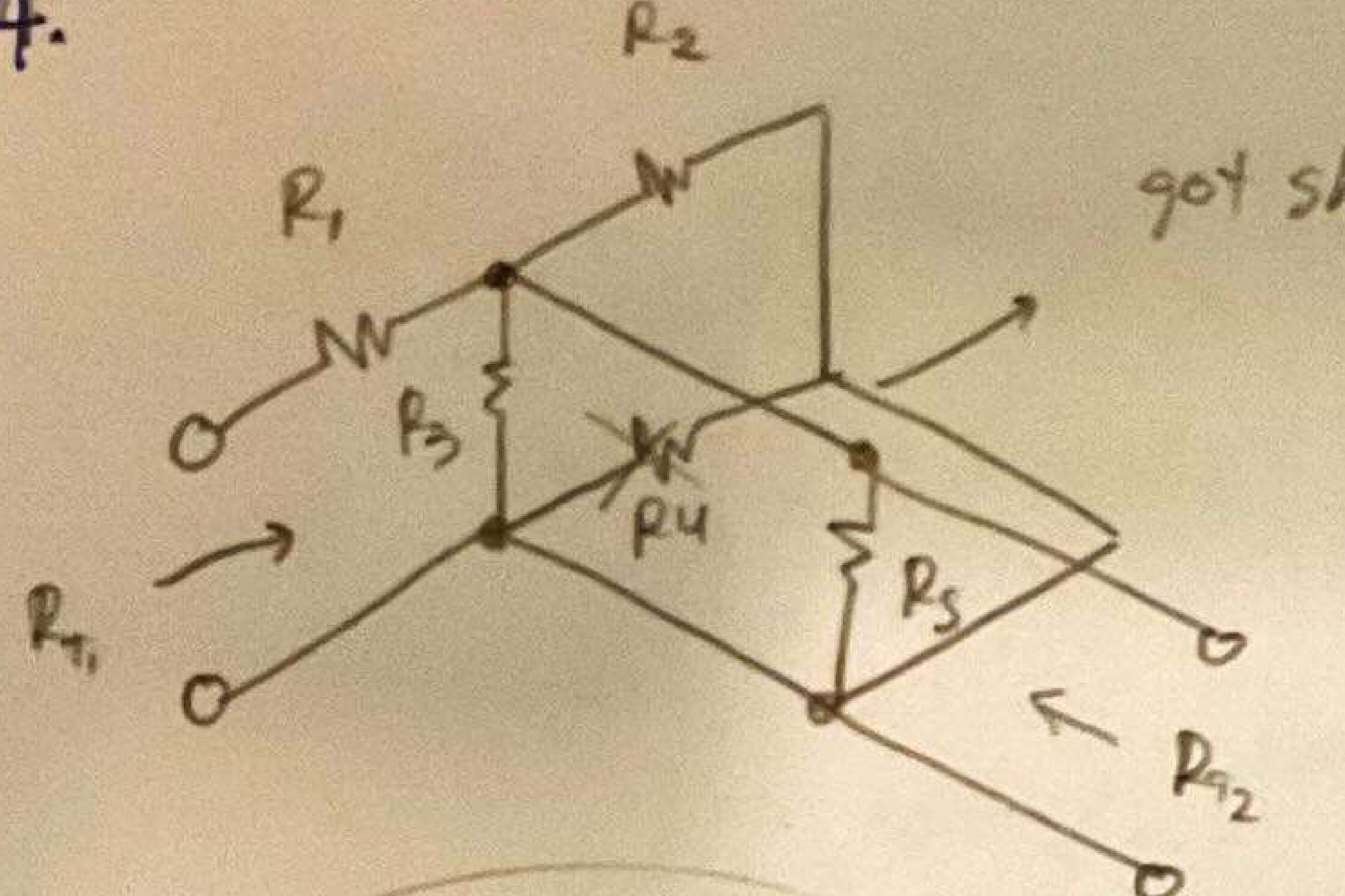
$p(t) = 8e^{-t} \times 10^{-3} \times (-16)(e^{-t}) = -128 \times 10^{-3}(e^{-2t}) = -0.128(e^{-2t})$

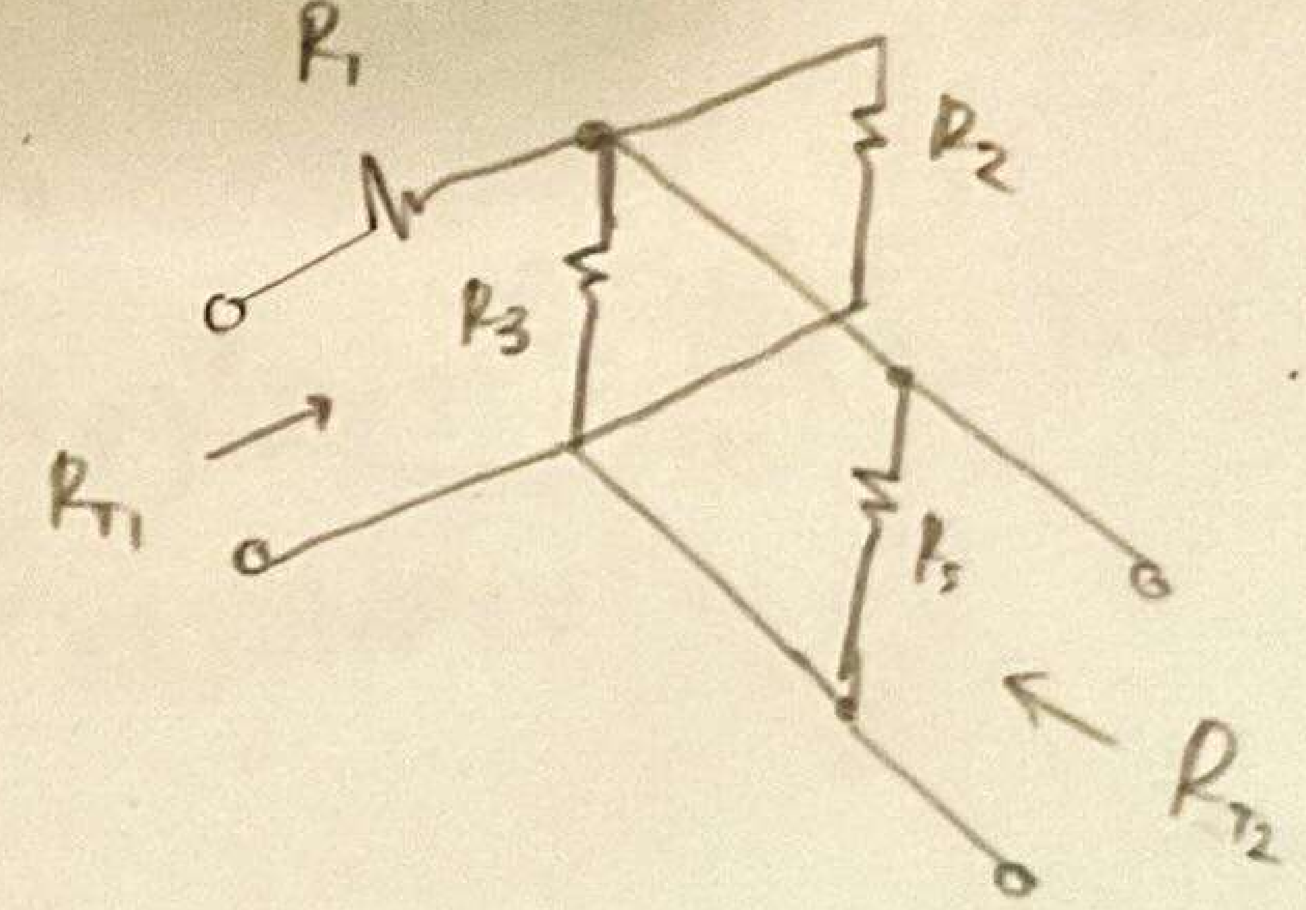
$p(0.5) = p(\frac{1}{2}) = -0.128(e^{-2\times 0.5}) = -0.128e^{-1} = -\frac{0.128}{e} = -0.049$ W.

(c)

$p = -2(10^{-3} i_1) = -2\times 10^{-3}(100 \times 10^{-3}) = -2 \times 10^{-4}$ W.

4.



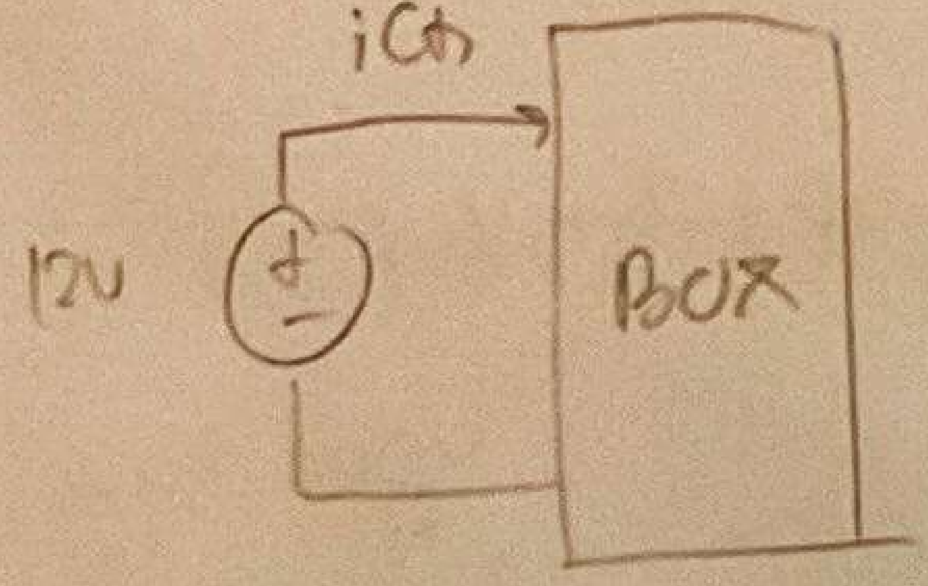


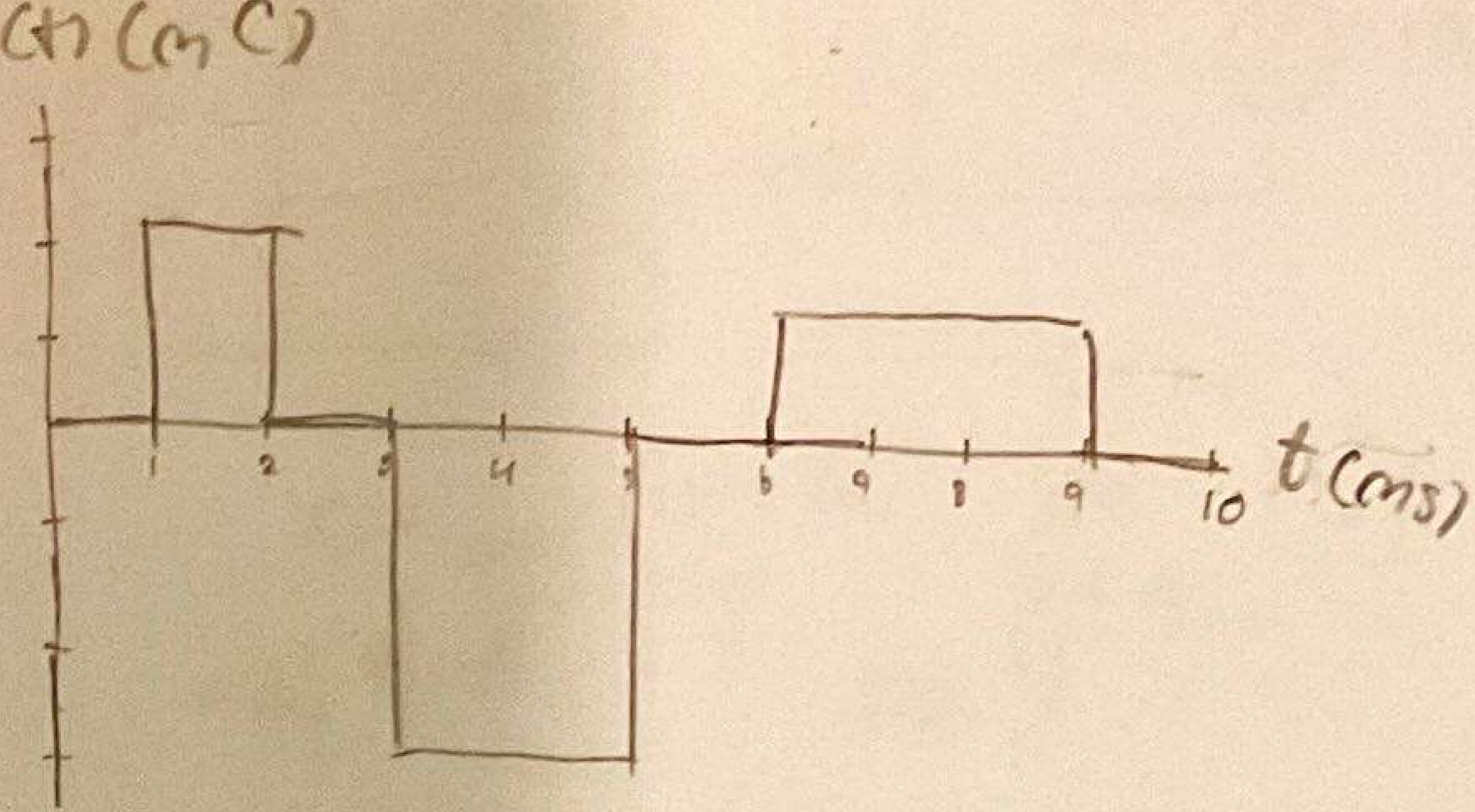
$R_{T_1} = R_1 + (R_3 // R_2 // R_5)$

$R_{T_2} = R_3 // R_2 // R_5$

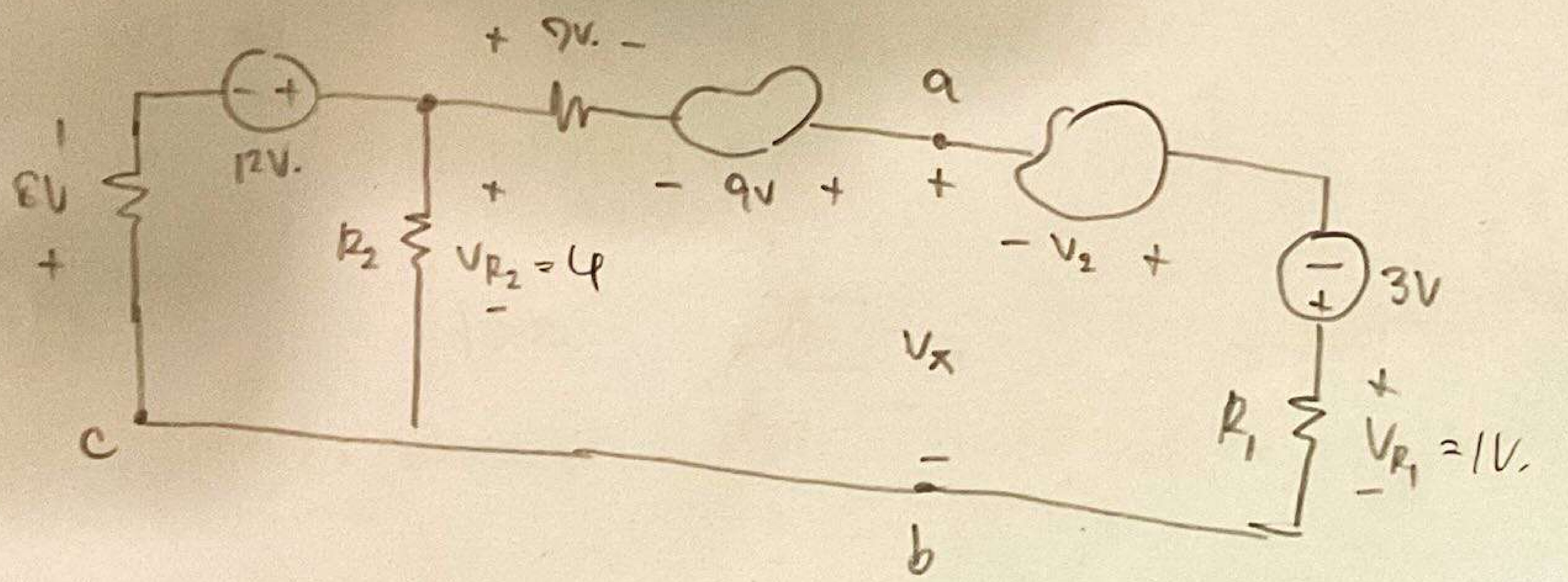
5.

$i = \frac{d}{dt} q(t)$



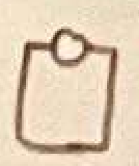


6.



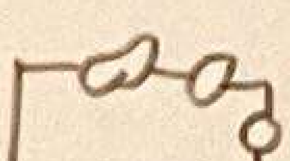
Find V_{R_2} & V_2

left most loop C: $8 - 12 + V_{R_2} = 0$



$V_{R_2} = 4$ volt $= 4V$

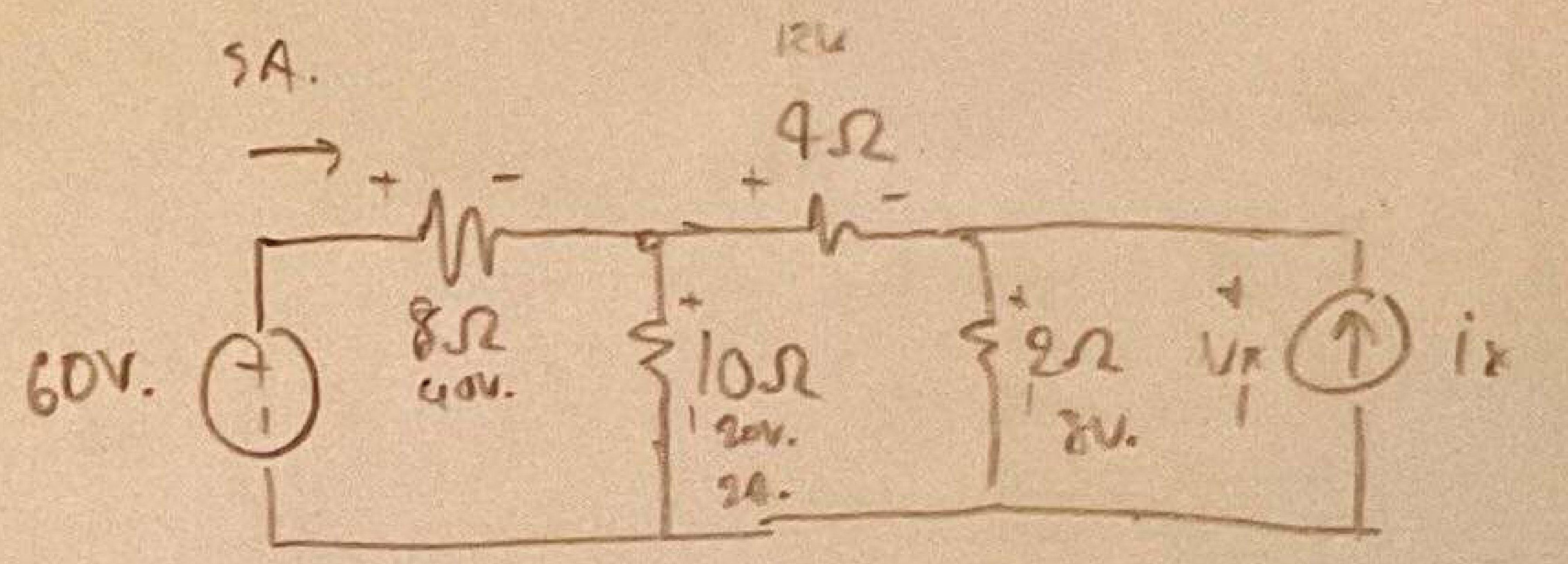
right most loop C: $-4 + 9 - 9 - V_2 - 3 + 1 = 0$



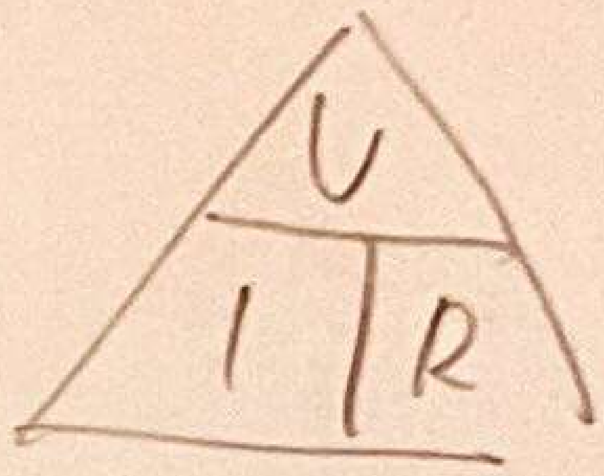
$-V_2 - 8 = 0$

$V_2 = -8$ V.

7.



$V_x = ?$



C KVL $-60 + 40 + V_{10\Omega} = 0$

$\frac{20}{10} = 2A.$ $V_{10\Omega} = 20v.$

C KVL $-20 + 12 + V_{2\Omega} = 0$

$V_{2\Omega} = 20 - 12$

$= 8V.$

T KCL $5 - 2 - \frac{V_{4\Omega}}{4} = 0$

$V_{4\Omega} = 3(4) = 12V$

C $-8 + V_x = 0$

$V_x = 8V.$

8.

$i = -250\mu A.$ source

a $-3kV.$

$i = 150\mu A.$

d load

$-$ 1kV $+$

$V_b = 4kV.$ b $i = -400\mu A$ load

e $-4kV$ source

$i = 200\mu A.$

1kV c $i = 400\mu A$ source

$i = 50\mu A$

f 4kV load

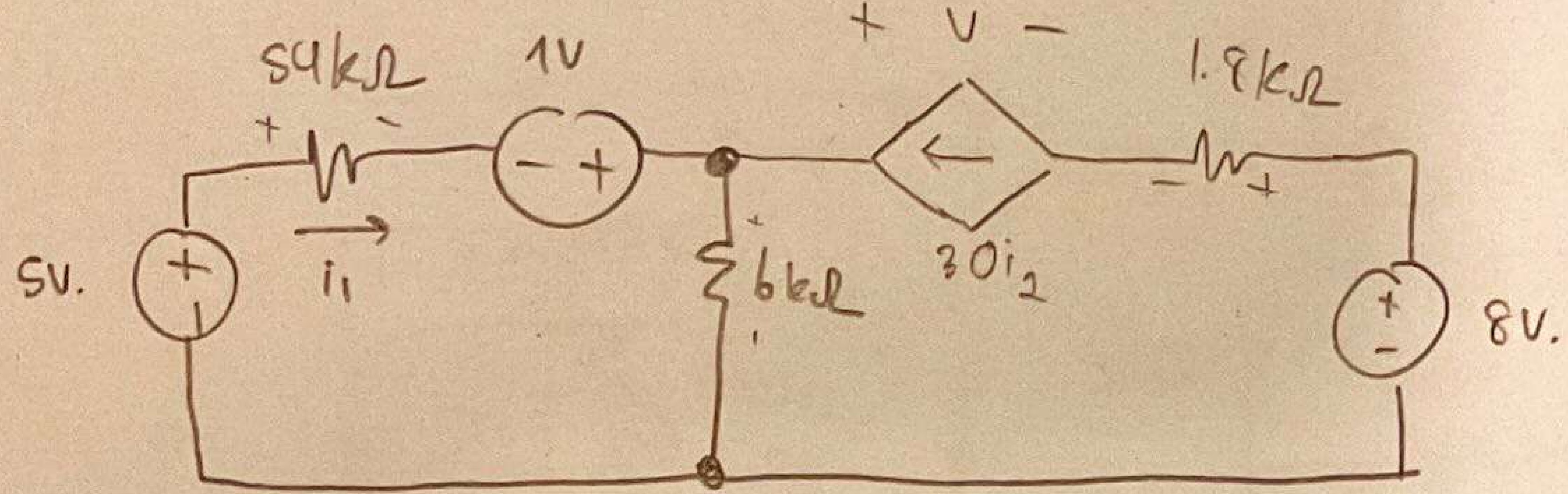
a	b	c	d	e	f
source	load	source	load	source	load

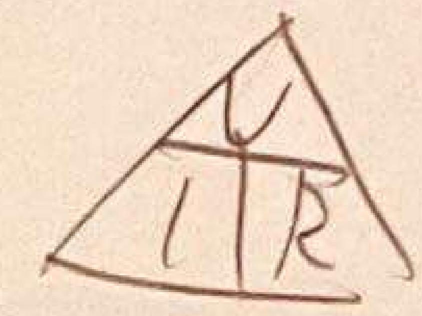
$(-250 \times 3) + (4 \times 400) + (-1 \times 400) + (1 \times 150) + (-4 \times 200) + (4 \times 50)$

$= 0$

↳ tellegen's theorem

9.





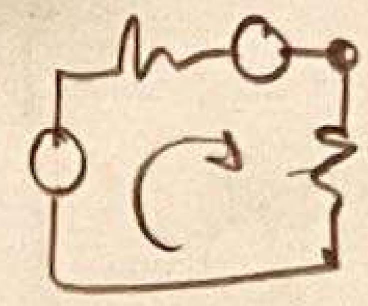
I = milli

V =

R = kilo

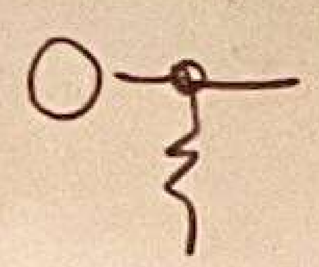
(a) i_1 in microamperes

$V_{54\Omega} = i_1 54$



KVL

KCL



$i_1 + 30i_1 - i_{6\Omega} = 0$

$i_{6\Omega} = 31i_1$

$V_{6\Omega} = (31i_1)(6) = 186i_1$

$-5 + 54i_1 - 1 + 186i_1 = 0$

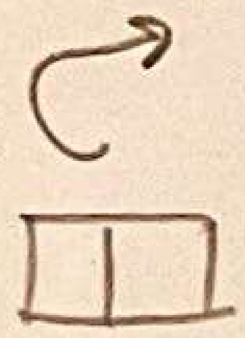
$240i_1 = 6$

$i_1 = \frac{6}{240} = \frac{1}{40}$

$i_1 = 0.025$

$i_1 = 25\,\mu A$. (a)

$= 25 \times 10^{-6}$



$-5 + (0.025)(54) - 1 + V - 1.8(30)(0.025) + 8 = 0$

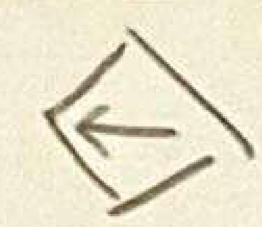
$V = -2$ Volt (b)

(c) total power generated

$P = 5(0.025) + 1(0.025) + 8(30)(0.025)$

$= 6.15$ mW $= 6150$ W.

− 2 +



The dependent current source, after calculated seems to absorb power.

(d) total power absorb

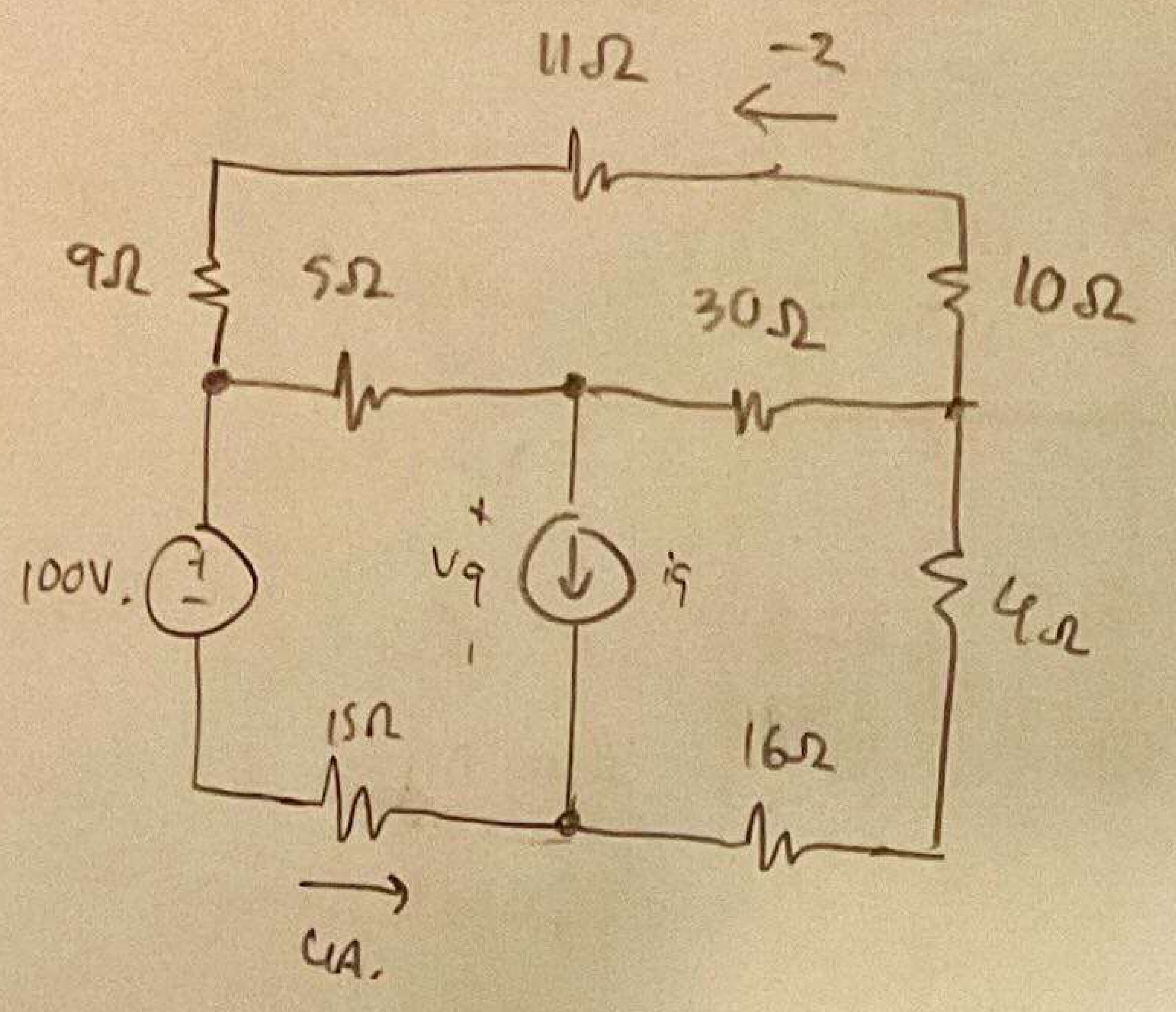
$P = (0.025)^2(54) + 186(0.025)^2(31) + (2)(30)(0.025) + 1.8(30)^2(0.025)^2$

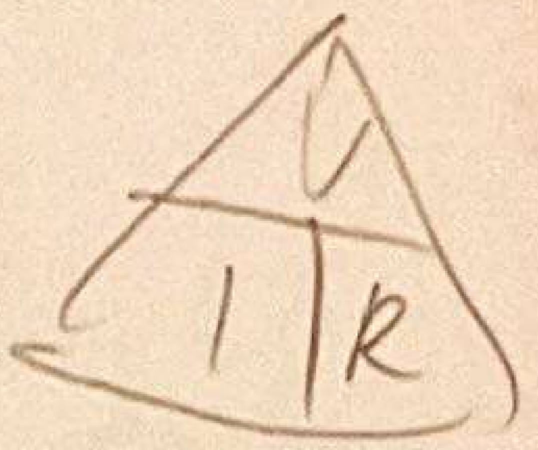
$= 6.15$ mW $= 6150$ W

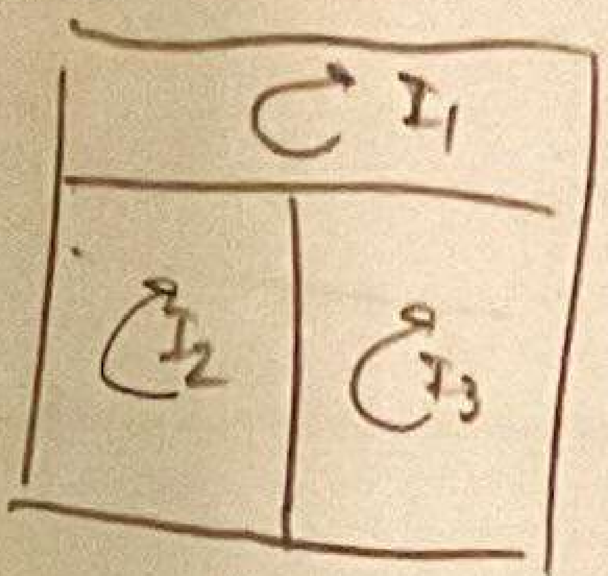
Or use tellegan theorem

power absorb + power generate = 0 power absorb = power generate

10.







$I_2 - I_3 = i_g$ -①

Supermesh $(I_2 + I_3)$

$I_2 = -4$
$I_1 = 2$
$I_3 = 5$

$15(I_2) - 100 + 5(I_2 - I_1) + (I_3 - I_1)(30) + 4I_3 + 16I_3 = 0$

$-60 - 100 + 5(-6) + (I_3 - 2)(30) + 4I_3 + 16I_3 = 0$

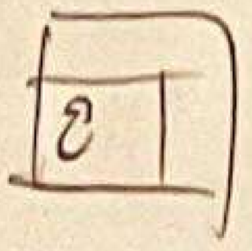
$-60 - 100 - 30 + 30I_3 - 60 + 4I_3 + 16I_3 = 0$

$50I_3 = 250$

$I_3 = 5$

①: $-4 - 5 = -9A. = I_g$ (a)

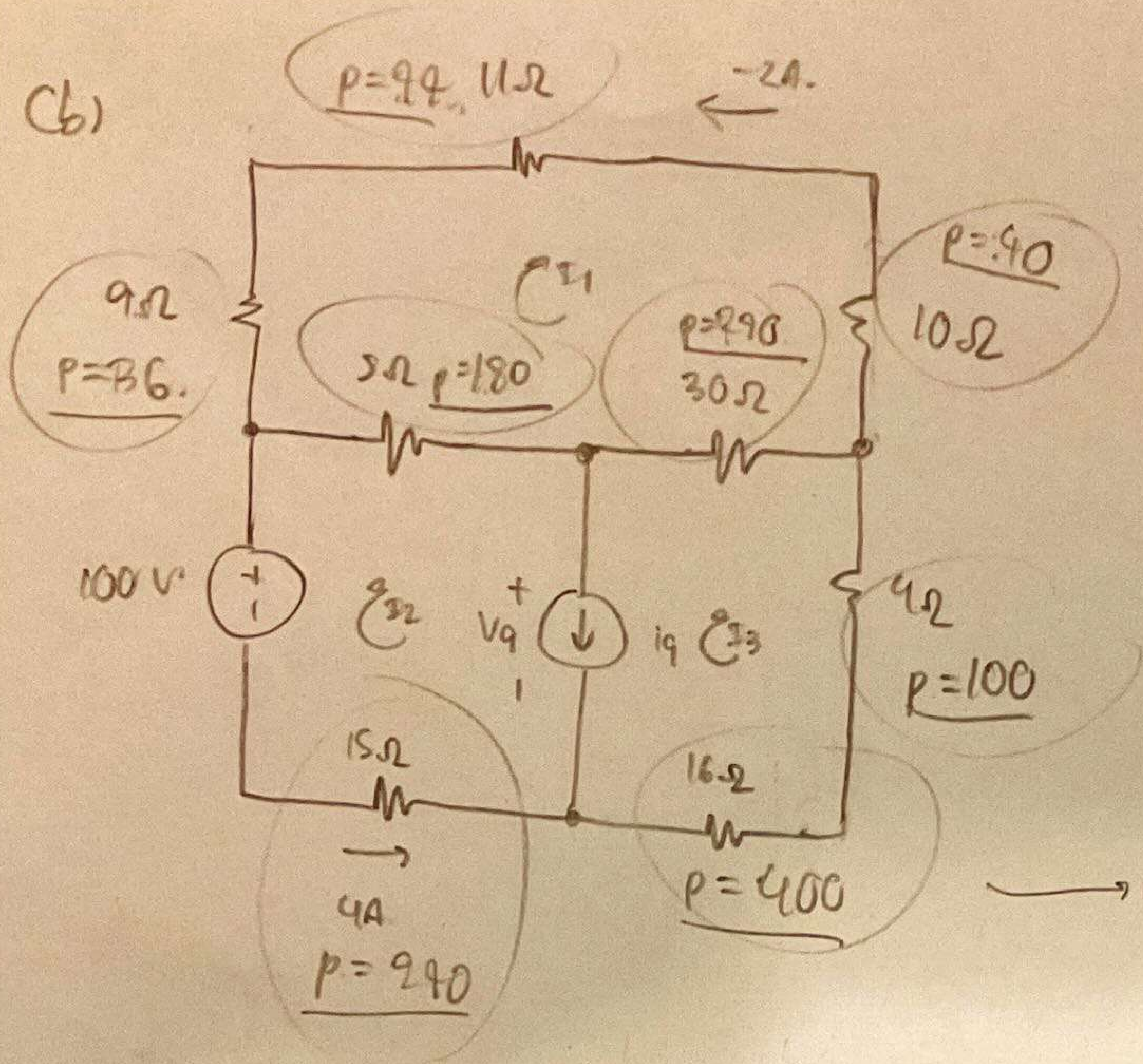
(c)



$-4(15) - 100 + 5(-6) + V_g = 0$

$V_g = 190$ (c)

(b)



$|(I_2 - I_1)^2 (5)| = 180$

$|(I_3 - I_1)^2 (30)| = 290$

→ (b)

(d)

current

This one is a LOAD not a source.

36 + 44 + 40 + 290 + 180 + 100 + 400 + 240 + 400 = 1910 → absorbed

−9(190) = −1910 → generated

absorbed + generated = 0 = 1910 − 1910 = 0