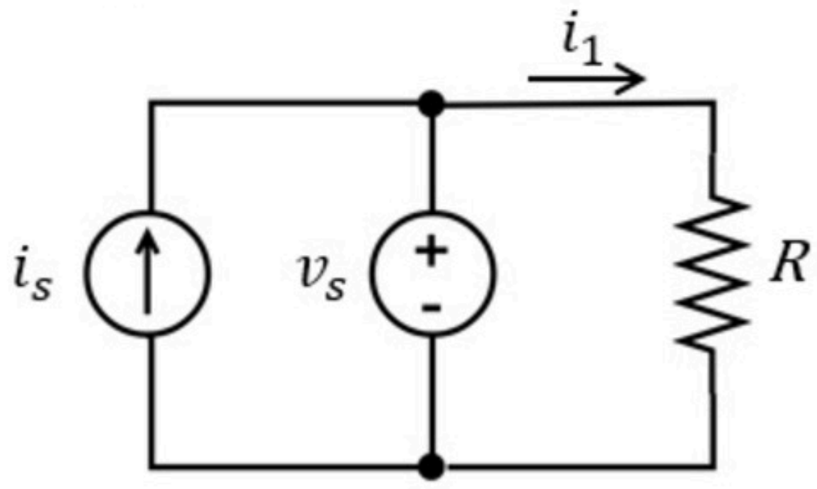
Basic concepts 006

Problem has been graded.

Find the current i_1 and the power P_1 received by the resistor.

Then change the current source to 5A. Recalculate the current i_1 (renaming it to i_2) and the power P_2 received by the resistor.



Given Variables:

v_s : 16 V

i_s : 4 A

R : 8 ohm

Calculate the following:

i_1 (A) :

P_1 (W) :

i_2 (A) :

P_2 (W) :

Hint: The voltage across a current source can be non-zero

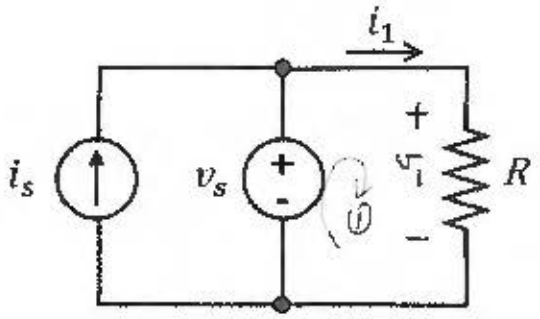
Find the current i_1 and the power P_1 received by the resistor.

Then change the current source to 5A. Recalculate the current i_1 (renaming it to i_2) and the power P_2 received by the resistor.

Vs = 16 V

Is = 4 A

R = 16 Ω



KVL①: $v_s = v_1 \Rightarrow v_1 = 16\,V$

$$i_1 = \frac{v_1}{R} = \frac{16}{16} \Rightarrow \boxed{i_1 = 1A}$$

$$P_1 = i_1^2 \cdot R = 1^2 \cdot 16 \Rightarrow \boxed{P_1 = 16\,W}$$

received

When $i_s = 5A$

v_1 still the same. $v_1 = 16\,V \Rightarrow i_2 = \frac{v_1}{R}$

$$\boxed{i_2 = 1A}$$

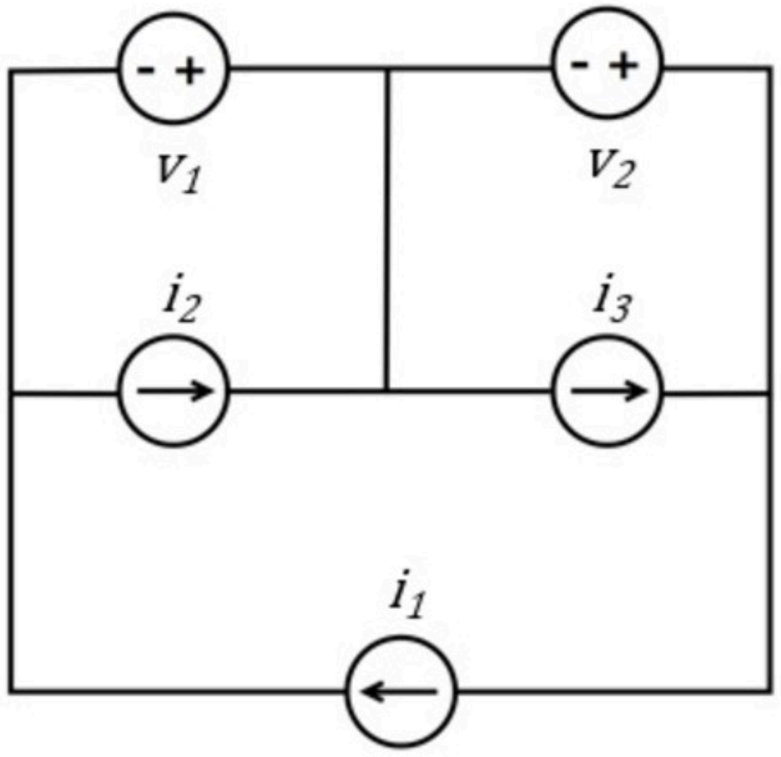
$$P_2 = i_2^2 R \qquad \boxed{P_2 = 16\,W}$$

received

Basic analysis 002

Problem has been graded.

Determine the power P_1 supplied by voltage source v_1 and the power P_2 supplied by voltage source v_2.



Given Variables:

i1 : 4 A

i2 : 2 A

i3 : 3 A

v1 : 3 V

v2 : 4 V

Calculate the following:

P1 (W) :

P2 (W) :

Determine the power P_1 supplied by voltage source v_1 and the power P_2 supplied by voltage source v_2.

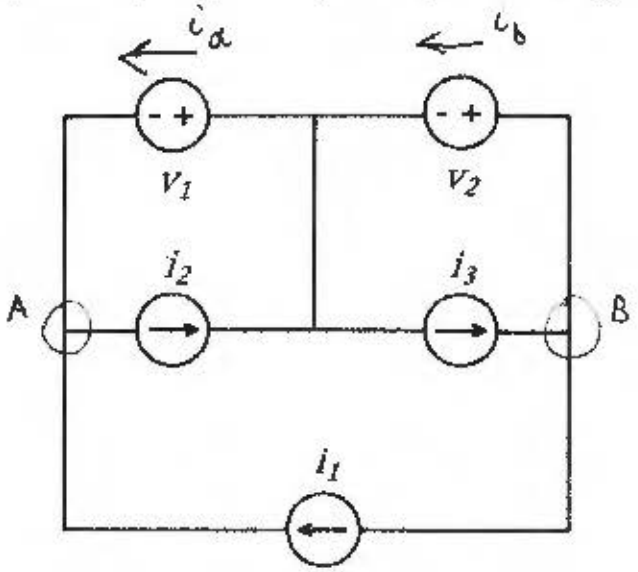
i1 = 4 A

i2 = 2 A

i3 = 3 A

v1 = 3 V

v2 = 4 V



KCL @ A : $i_1 + i_a = i_2 \Rightarrow i_a = 2 - 4 = -2\,A$

$P_1 = v_1 \cdot i_a = -6\,W$ RECEIVED (PASSIVE SIGN CONVENTION)

$\boxed{P_1 = 6\,W}$ SUPPLIED

KCL @ B : $i_3 = i_b + i_1 \Rightarrow i_b = 3 - 4 = -1\,A$

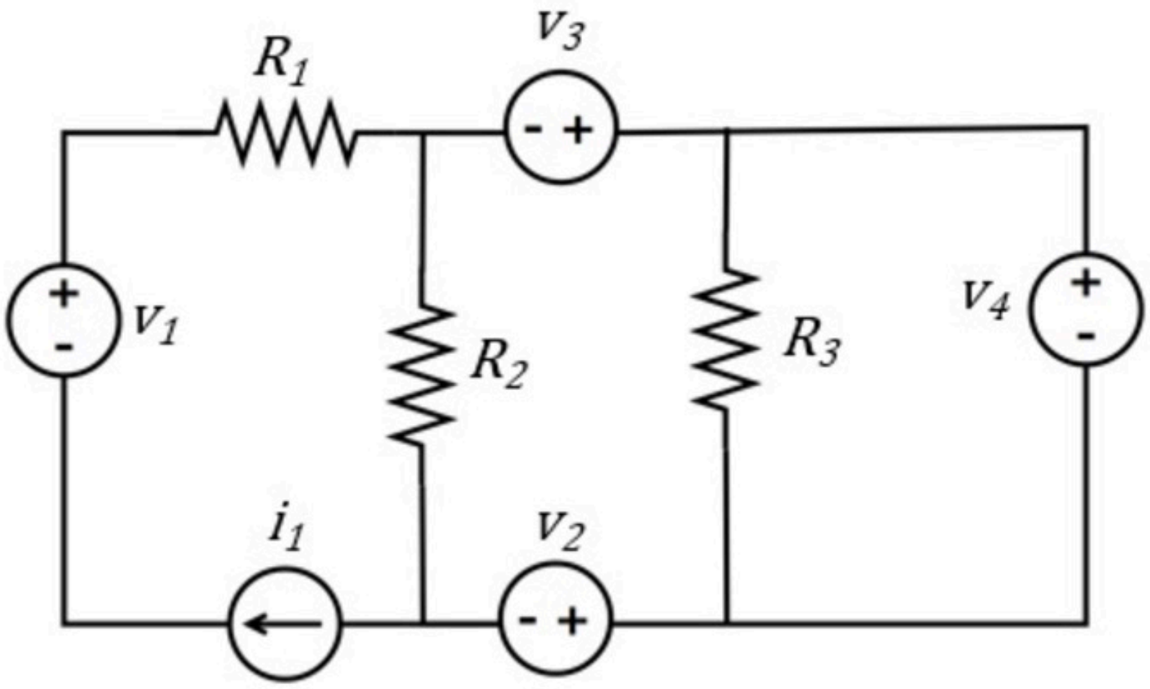
$P_2 = v_2 \cdot i_b = -4\,W$ RECEIVED

$\boxed{P_2 = 4\,W}$ SUPPLIED

Basic analysis 003

Problem has been graded.

Determine the power received by each of the three resistors.



Given Variables:

v1 : 3 V

v2 : 5 V

v3 : 1 V

v4 : 2 V

i1 : 1 A

R1 : 2 ohm

R2 : 3 ohm

R3 : 4 ohm

Calculate the following:

P1 (W) :

P2 (W) :

P3 (W) :

> Hint: Find currents using KCL and KVL

Determine the power received by each of the three resistors.

v1 = 2 V

v2 = 3 V

v3 = 4 V

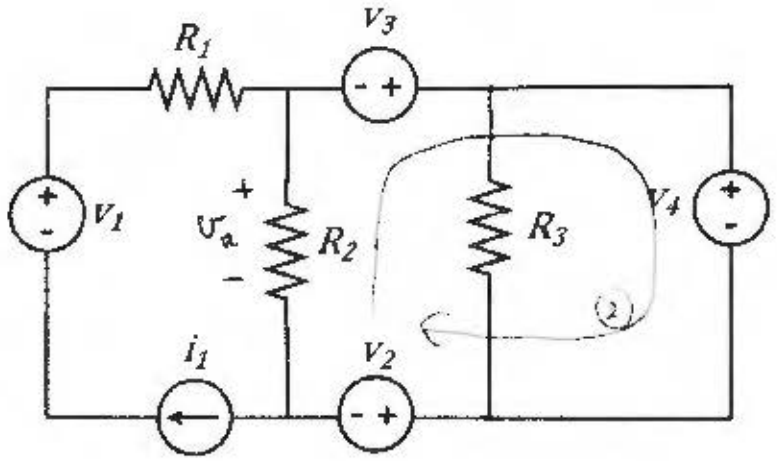
v4 = 2 V

i1 = 4 A

R1 = 2 Ω

R2 = 1 Ω

R3 = 4 Ω



(a) R_1 : $P = R_1 \cdot i_1^2 = 2 \cdot 4^2$ $\boxed{P_{R_1} = 32\ W}$

(b) R_3 : $P = \frac{v_4^2}{R_3} = \frac{4}{4}$ $\boxed{P_{R_3} = 1\ W}$

(c) KVL in (2) : $v_a + v_3 - v_4 - v_2 = 0$

$v_a = -4 + 2 + 3 = 1\ V$

$P = \frac{v_a^2}{R_2} = \frac{1}{1}$ $\boxed{P_{R_2} = 1\ W}$

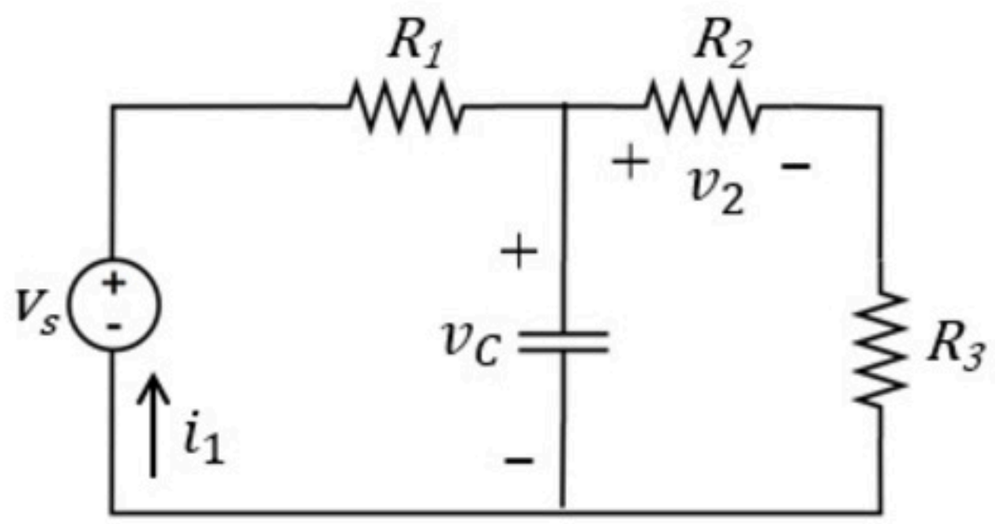
Basic analysis 011

Problem has been graded.

This circuit contains a capacitor (which we will cover in detail later in this course) with a voltage v_C across it. Voltage v_2 and current i_1 will satisfy the equations shown below (as we will also see later).
Find the coefficients *A*, *D* and *E*.

$v_C = 10 - 10 \cdot e^{-20t}$ V

$v_2 = A + B \cdot e^{-20t}$ V $\qquad$ $i_1 = D + E \cdot e^{-20t}$ A



Given Variables:

vs : 20 V

R1 : 20 ohm

R2 : 7 ohm

R3 : 13 ohm

Calculate the following:

A (.) :

B (.) :

D (.) :

E (.) :

This circuit contains a capacitor (which we will cover in detail later in this course) with a voltage v_C across it. Voltage v_2 and current i_1 will satisfy the equations shown below (as we will also see later).
Find the coefficients *A*, *D* and *E*.

Vs = 15 V

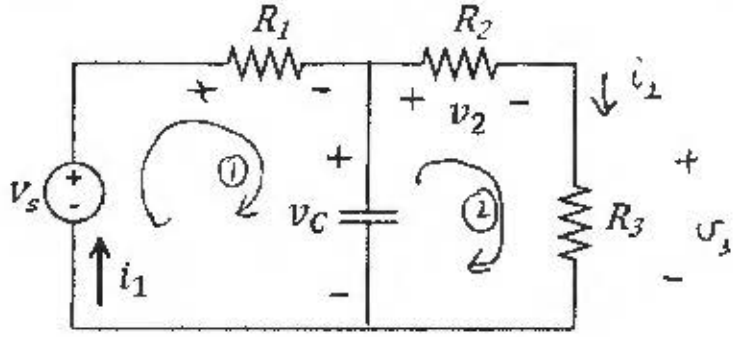
R1 = 10 Ω

R2 = 15 Ω

R3 = 5 Ω

$$v_C = 10 - 10 \cdot e^{-20t} \text{ V}$$

$$v_2 = A + B \cdot e^{-20t} \text{ V} \qquad i_1 = D + E \cdot e^{-20t} \text{ A}$$



KVL IN ① : $v_S - v_{R_1} - v_C = 0$ $\qquad v_{R_1} = i_1 R_1$

$$\Rightarrow \quad i_1 = \frac{1}{R_1}\cdot\left(v_S - v_C\right) = \frac{1}{10}\left(15 - 10 + 10\,e^{-20t}\right)$$

$$= \frac{1}{10}\left(5 + 10\,e^{-20t}\right)$$

D = 0.5 **E = 1**

KVL in ② : $v_C - v_2 - v_3 = 0$ $\qquad v_2 = i_2 \cdot R_2$

$v_3 = i_2 \cdot R_3$

$$\Rightarrow \quad v_C = v_2 + v_3 = i_2\left(R_2 + R_3\right)$$

$$\Rightarrow \quad v_2 = R_2 \cdot i_2 = v_C \cdot \frac{R_2}{R_2 + R_3}$$

$$= v_C \cdot \frac{15}{20}$$

⇝ THIS COULD ALSO BE FOUND DIRECTLY WITH VOLTAGE DIVIDER

$$\Rightarrow \quad v_2 = 7.5 - 7.5\,e^{-20t}$$

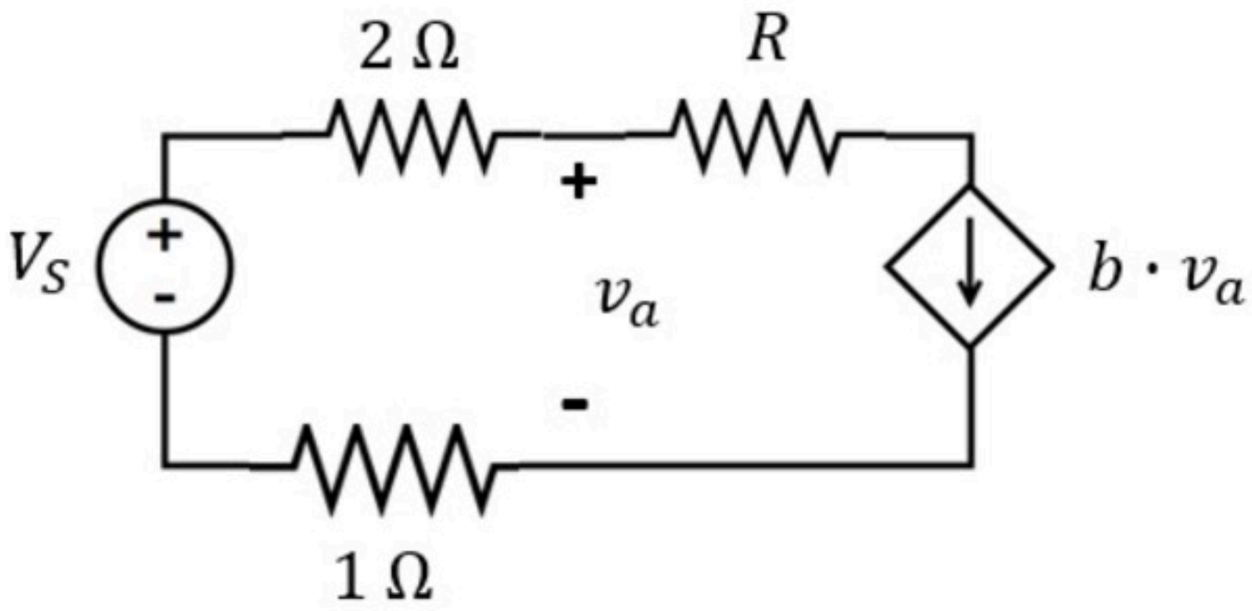
A = 7.5 **B = -7.5**

Basic analysis 013

No more attempts left.

Find v_a.

What is the power *P* received by the dependent source?



Given Variables:

Vs : 7 V

R : 2 ohm

b : 2 A/V

Calculate the following:

va (V) :

P (W) :

Hint: KVL also works when the voltage drop is not across an element.

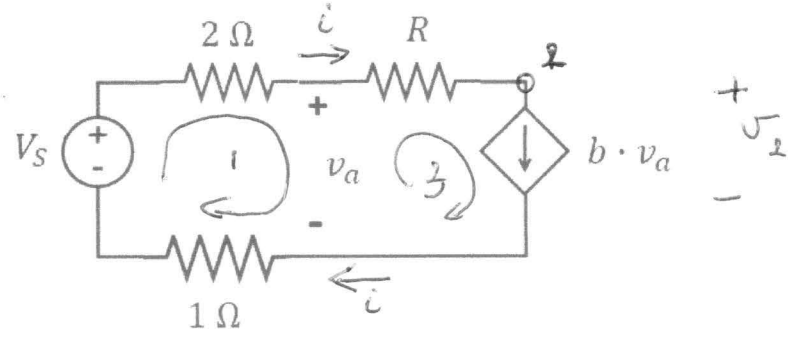
Find v_a.

What is the power *P* received by the dependent source?

Vs = 7 V

R = 2 Ω

b = 2 A/V



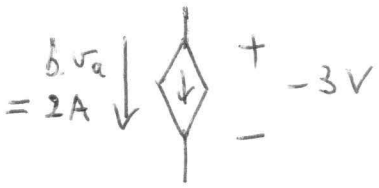
KVL 1 : $V_S = 2 \cdot i + v_a + 1 \cdot i \Rightarrow V_S = 3i + v_a$ (1)

KCL 2 : $i = b\, v_a$ (2)

(2) in (1) : $V_S = 3b v_a + v_a = 7 \cdot v_a \Rightarrow \boxed{v_a = 1\,V}$

$\overset{(2)}{\Rightarrow} i = 2 \cdot v_a = 2\,A$

KVL 3 : $v_a = R \cdot i + v_2 \Rightarrow v_2 = 1 - 2 \cdot i = -3\,V$



PASSIVE SIGN CONVENTION

$P = (-3) \cdot 2 = -6$

$\boxed{P = -6\,W \quad \text{RECEIVED}}$