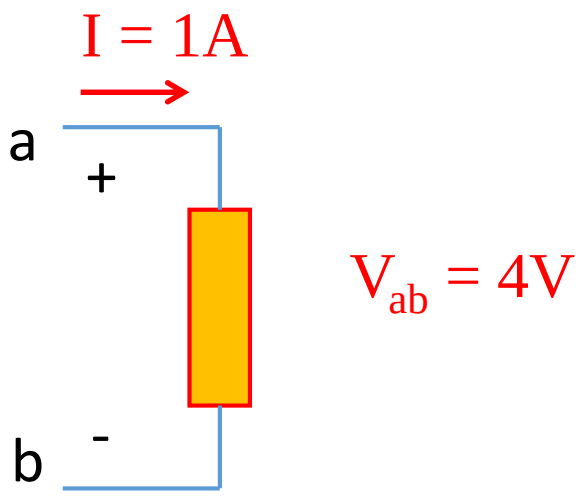
EECS/CSE 70A Network Analysis I

Homework #1
Solution Key

Problem 1: Find the power absorbed or supplied by the element.



$V_{ab} = 4V$

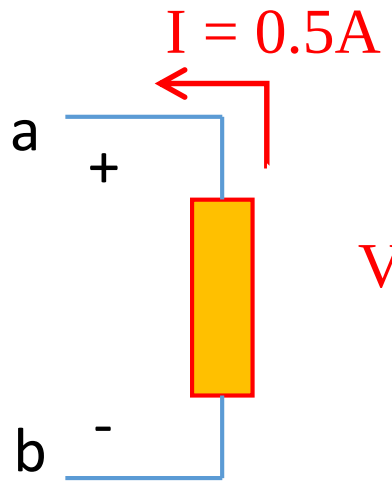
Problem 1 Solution

$P = V_{ab}I_{ab}$ where $I_{ab} = I = 1A$

$P = (4V)x(1A) = 4W$

$P > 0$, therefore the element is a power sink (it absorbs power)

Problem 2: Find the power absorbed or supplied by the element.



$V_{ab} = 12V$

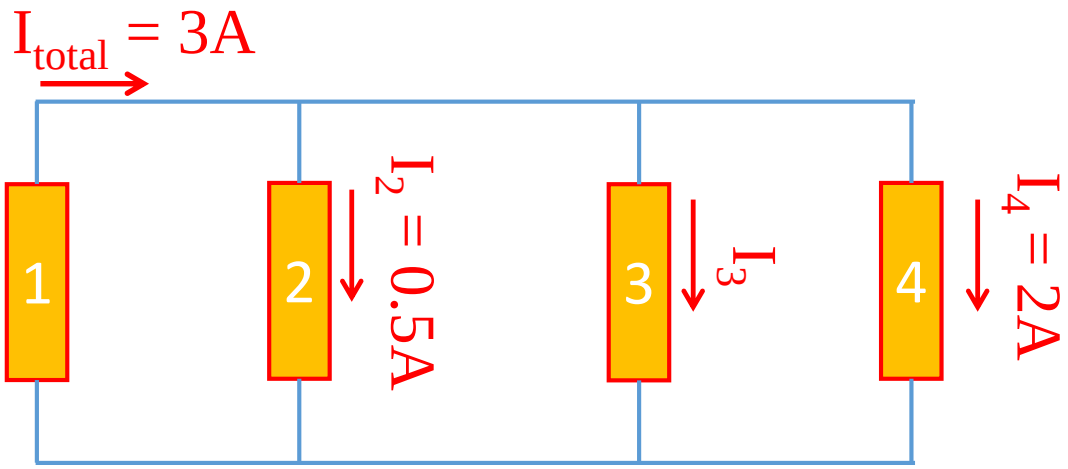
Problem 2 Solution

$P = V_{ab}I_{ab}$ where $I_{ab} = -I = -0.5A$

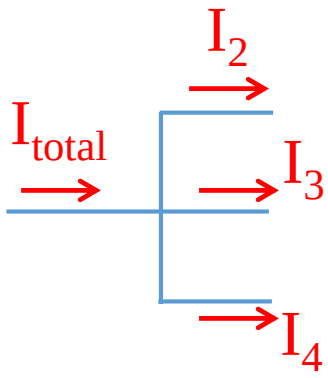
$P = (12V)x(-0.5A) = -6W$

$P < 0$, therefore the element is a power source (it supplies power)

Problem 3: Find the current I_3 flowing through element 3.



Problem 3 Solution



$I_{total} = I_2 + I_3 + I_4$

$I_3 = I_{total} - I_2 - I_4$

$I_3 = 3A - 0.5A - 2A$

$I_3 = 0.5A$

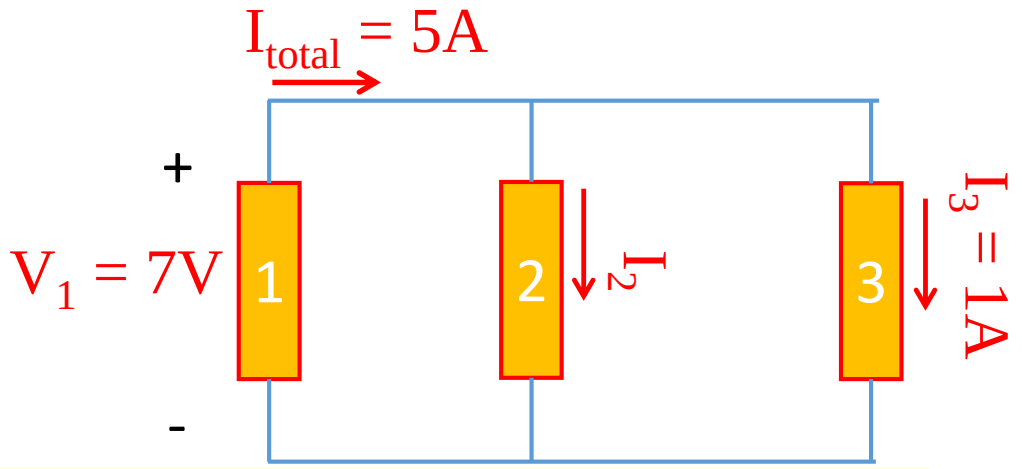
Problem 4:

a) Find I_2

b) Find the power absorbed or supplied by element 2

c) Find the power absorbed or supplied by element 1

d) Is element 1 a source or a sink? Repeat for elements 2 and 3.



Problem 4 Solution

a) $I_{total} = I_2 + I_3$

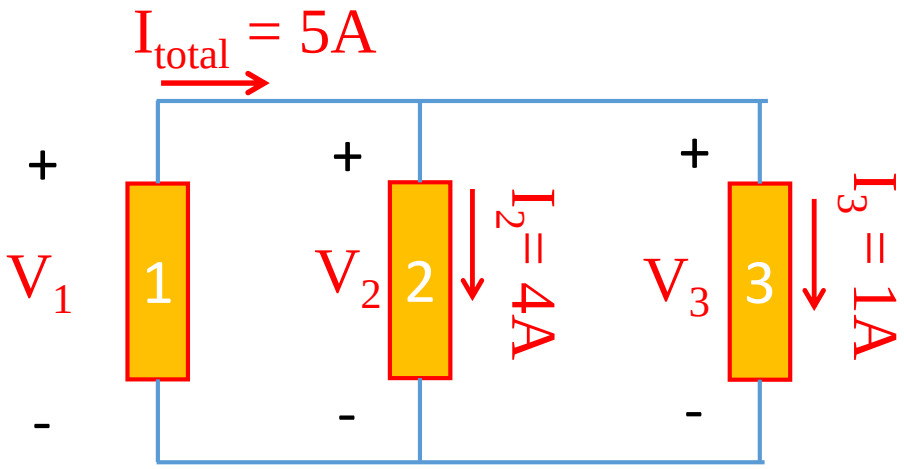
$I_2 = I_{total} - I_3$

$I_2 = 5A - 1A = 4A$

b) $P_2 = V_2 I_2$ with V_2 shown in the schematic on the right

$V_1 = V_2 = V_3 = 7V$

$P_2 = V_2 I_2 = 7V \times 4A = 28W$



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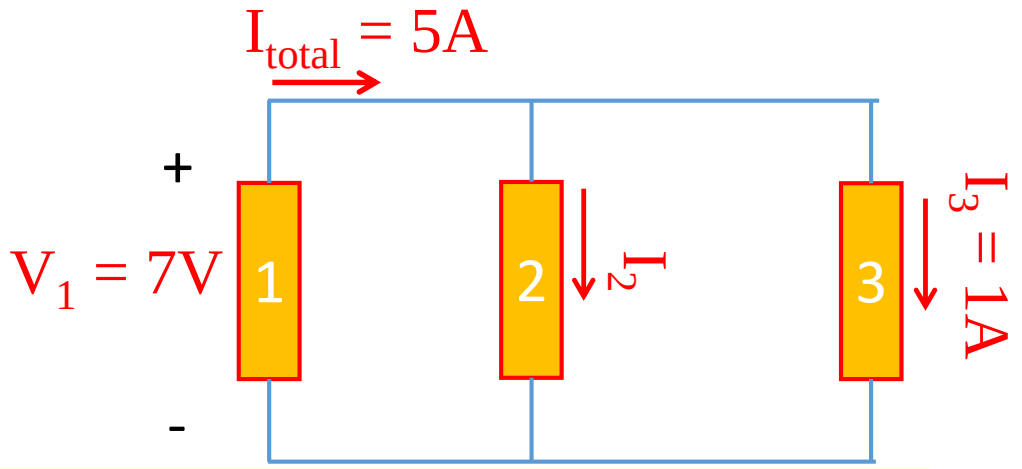

Problem 4 Solution

c) $P_1 = V_1 I_1$ where $I_1 = -I_{total} = -5A$

$P_1 = V_1 I_1 = (7V) \times (-5A) = -35W$

d) $P_1 = -35W < 0$ element 1 is a power source

$P_2 = 28W > 0$ element 2 is a power sink

$P_1 + P_2 + P_3 = 0$ (power balance)

$P_3 = -P_1 - P_2 = -(-35W) - 28W = 7W$

OR $P_3 = V_3 I_3 = (7V) \times (1A) = 7W$

$P_3 = 7W > 0$ element 3 is a power sink