EEE1024: Fundamentals of Electrical and Electronics Engineering

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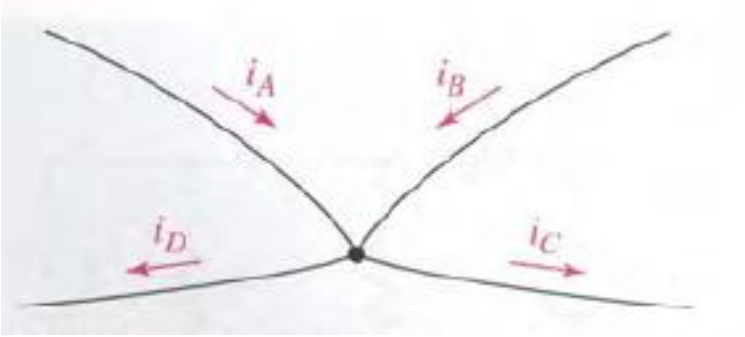
Assessments and Other Guidelines

Assessment Type	Date	Max. marks	Weightage	Remarks
Assignment I	Before CAT I	30	10%	Questions and Rubrics will be given later
Assignment II	After CAT II	30	10%	Questions and Rubrics will be given later
Quizes	Throughout the course	50	10%	During class
CAT-I	As per University announcement		15%	Schedule to be announced by University in due course.
CAT-II			15%	
FAT			40%	

ATTENDANCE: 75% !!!

Kirchhoff's Current law (KCL)



Algebraic sum of currents entering any node is zero

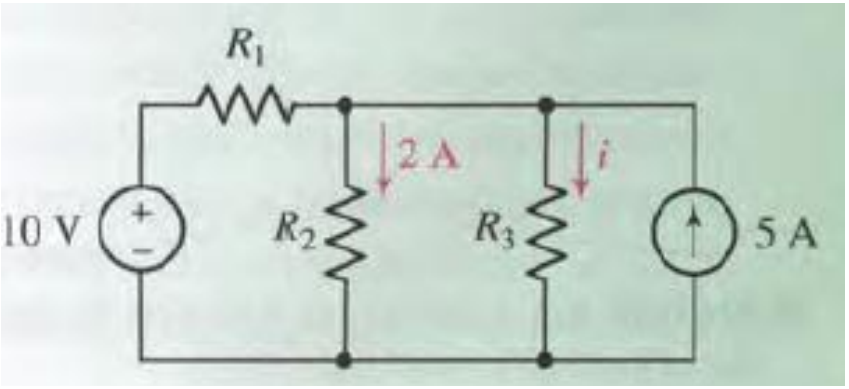
Entering the node $i_A + i_B + (-i_C) + (-i_D) = 0$

Leaving the node $(-i_A) + (-i_B) + i_C + i_D = 0$

$$i_A + i_B = i_C + i_D$$

$$\sum_{n=1}^{N} i_n = 0$$

Example: If the voltage source supplies 3A of current, compute the current through resistor R_3

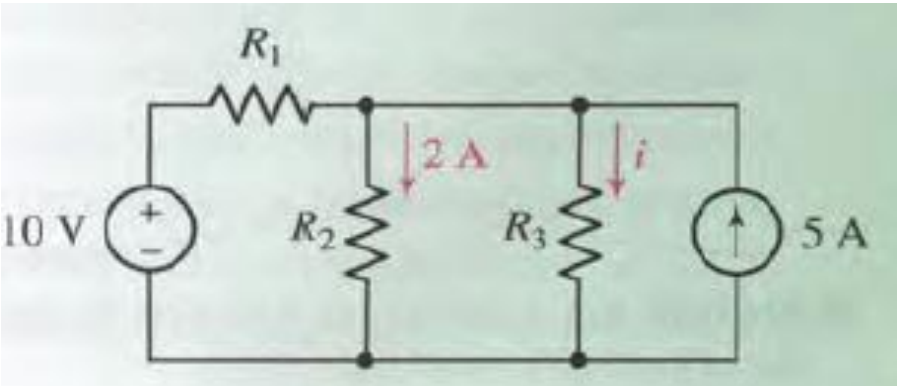


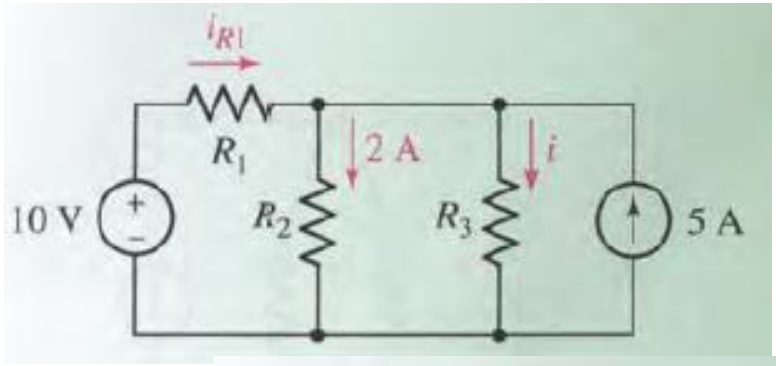
Strategy for such questions

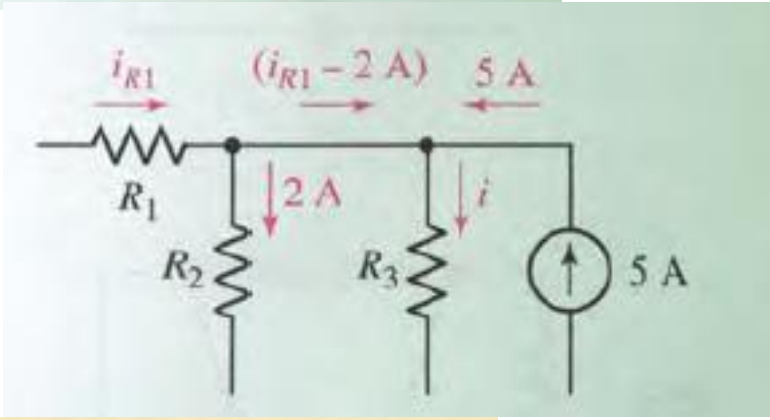
1) Identify goal of the problem
2) Collect known info
3) Devise a plan
4) Construct proper set of equations.

Kirchhoff's Current law (KCL)

Example: If the voltage source supplies 3A of current, compute the current through resistor R_3







1) <u>Identify goal of the problem</u>:
   Labelled 'i' on the figure
2) <u>Collect known info</u>:
   Top node of R_3 connected to 3 branches. Current flowing into this node will have currents from these 3 branches.
3) <u>Devise a plan</u>:
   Label current thr' R1 and write KCL at the top node of R_3
4) <u>Construct proper set of equations</u>:
   Summing up the currents flowing into the node -

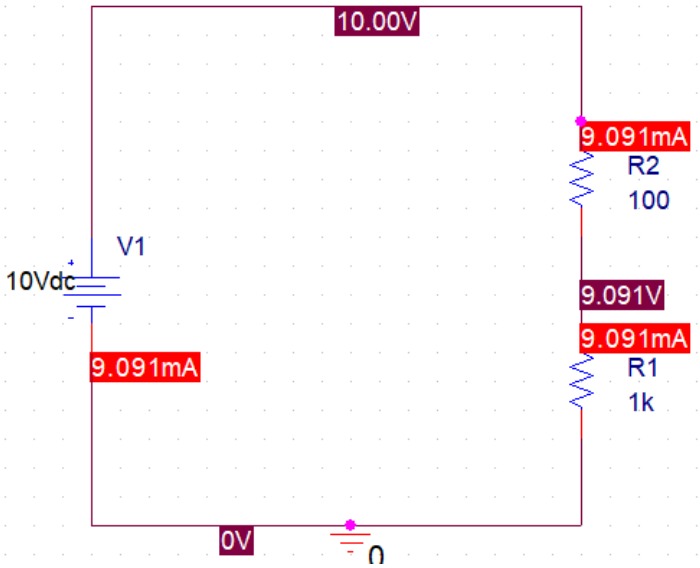
$$i_{R_1} - 2 - i + 5 = 0$$

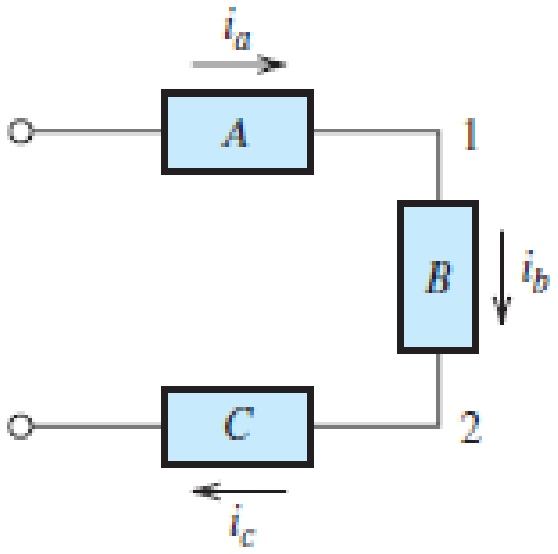
$$3 - 2 + 5 = i$$

$$i = 6A$$

Which node to choose?

Kirchhoff's Current law (KCL)





Elements connected from end to end ——— Series circuit

CURRENT in a ***SERIES*** circuit – remains same!

Apply KCL to check this!

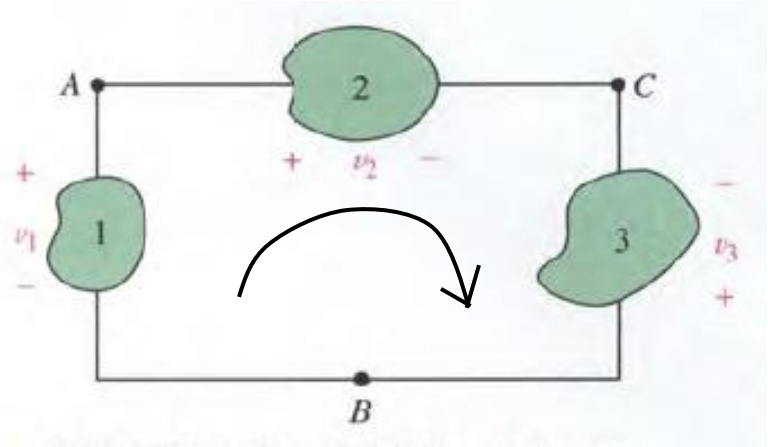
@ Node 1, $i_a = i_b$

@ Node 2, $i_b = i_c$

Thus, $i_a = i_b = i_c$

Kirchhoff's Voltage law (KVL)

Algebraic sum of voltages around any closed path is zero



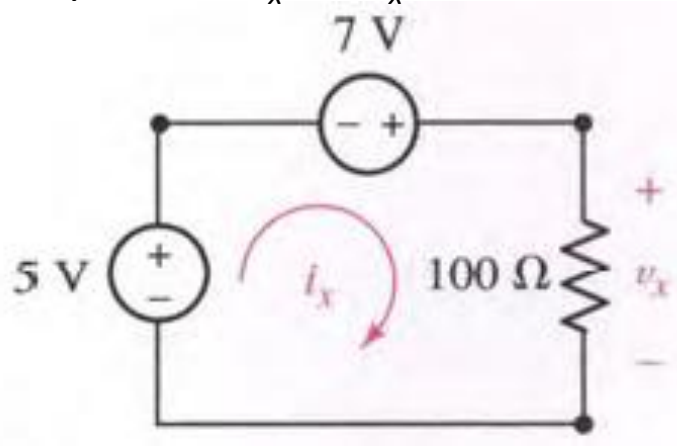
$$v_1 + v_2 + v_3 + \cdots + v_N = 0$$

$$\sum_{n=1}^{N} v_n = 0$$

Move mentally in a clockwise direction, write voltage of each element in such a way that if a +ve terminal is encountered then +ve, and if –ve terminal, then -ve

$$-v_1 + v_2 - v_3 = 0$$

Example: Find v_x and i_x

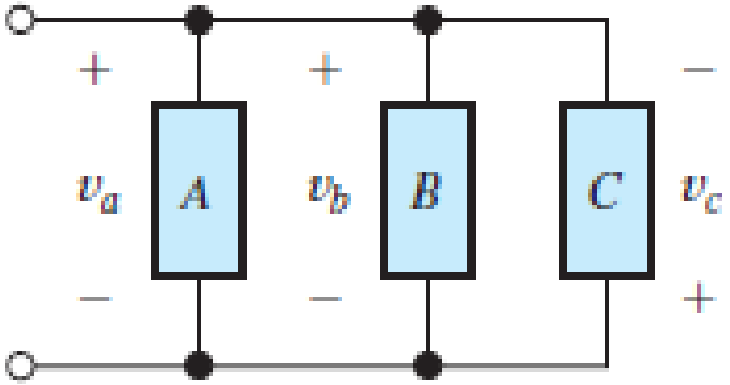


Applying KVL,

$$-5 - 7 + v_x = 0$$

$$i_x = \frac{v_x}{100} = \frac{12}{100}\ \text{A} = 120\ \text{mA}$$

Kirchhoff's Voltage law (KVL)



Both ends of an element to the corresponding ends of the other _____ Parallel circuit

VOLTAGE in a ***PARALLEL*** circuit – remains same!

Apply KVL to check this!

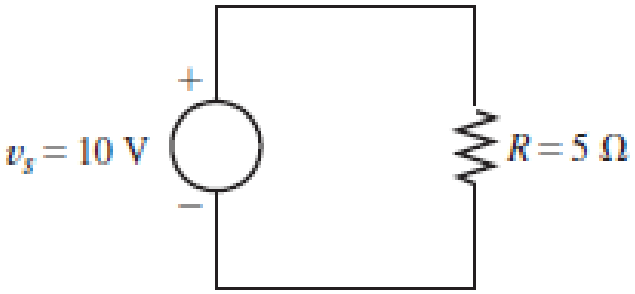
@ Loop 1, $-v_a + v_b = 0$

@ Loop 2, $-v_a - v_c = 0$

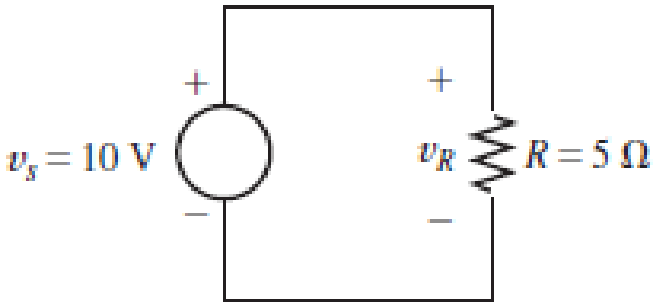
Thus, $V_a = V_b = -V_c$

Practice

Q) Find voltages, current and power in this simple circuit



1)Apply KVL to the loop -

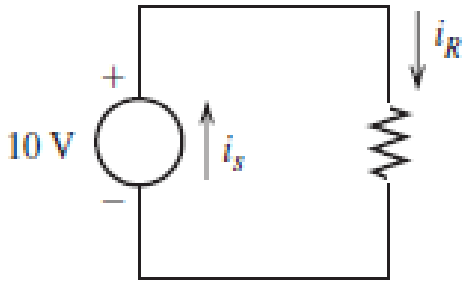


$$v_R - v_s = 0$$

v_R = 10V

2) Source and R in parallel –
V has to be same!

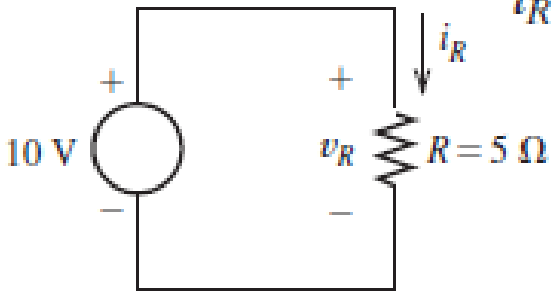
4) Apply KCL to 2 nodes



$$i_s = i_R$$

3) Use Ohm's law -

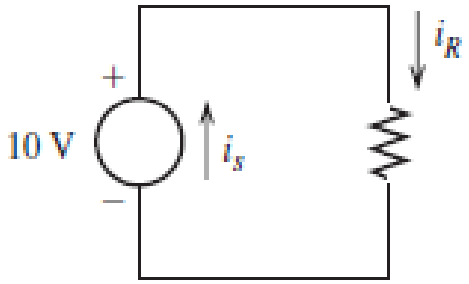
$$i_R = 10/5 = 2\ \text{A}.$$



5) Source and resistance in series – I has to same!

Practice

Q) Find voltages, current and power in this simple circuit



Case where source and R were in series and parallel!

Happens only in a 2 element circuit

Power delivered to resistor

$$p_R = v_R i_R = 10 \times 2 = 20 \text{ W}$$

$$p_R = i_R^2 R = 2^2 \times 5 = 20 \text{ W}$$

$$p_R = \frac{v_R^2}{R} = \frac{10^2}{5} = 20 \text{ W}$$

Power supplied by the source

$$p_s = -v_s i_s = -10 \times 2 = -20 \text{ W}$$

Law of conservation of energy!