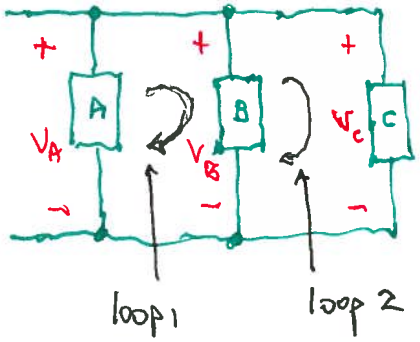
Thursday, January 21, 2016

Parallel circuits:



KVL around loop 1

$-V_A + V_B = 0$, so $V_A = V_B$

KVL around loop 2

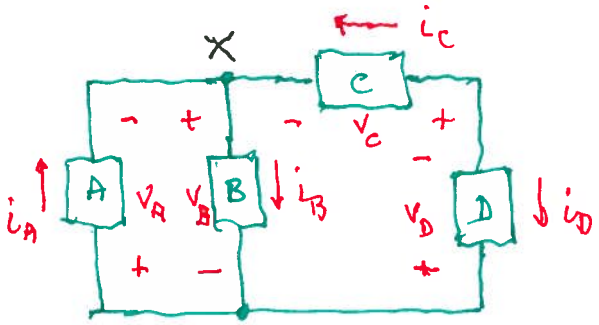
$-V_B + V_C = 0$, so $V_B = V_C$

Therefore $V_A = V_B = V_C$

Circuit elements in parallel have the same voltage.

KVL/KCL examples

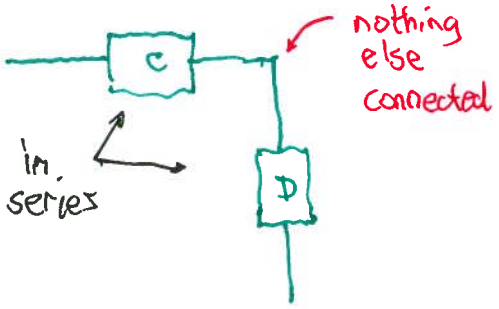
Example 1: Consider the circuit below, labeled as shown.

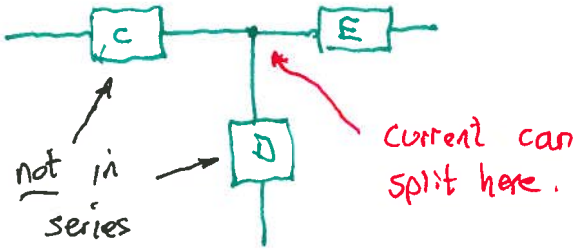


(a) what's in series, what's in parallel?
(b) what's i_C in terms of i_D?
(c) $i_A = 3$, $i_C = 1$. Find i_B, i_D.

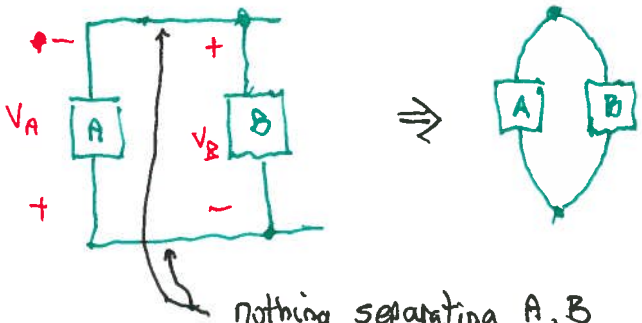
Solution

(a) In series: only C and D (where they join, nothing else joins).

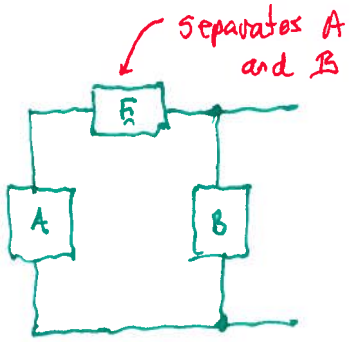




In parallel: Only A and B



nothing separating A, B
(A, B in parallel)



A, B not in parallel
(because A and B are separated at the top by E).

(b) Since C and D in series, they must have identical currents.

$$i_C = -i_D$$

(c) KCL at node X: $i_A + i_C - i_B = 0$

$$i_B = i_A + i_C = 3 + 1 = 4 \text{ A}$$

and $i_D = -i_C$, so $i_D = -1$ A.