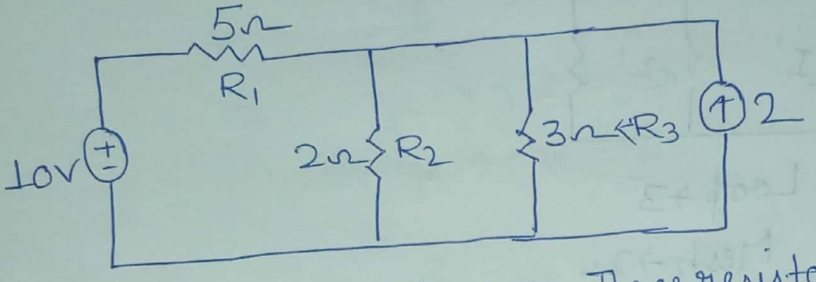
12/2/2021

Lec. 04

Circuit → A circuit is closed Conducting path through which an electric Current flows

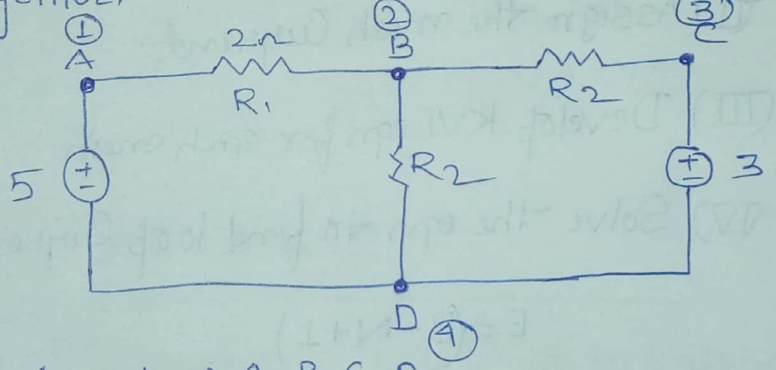
Branch → A branch is Single element or Component in ckt.



5; Branch → 10V, 2A, Three resistor → R1, R2, R3

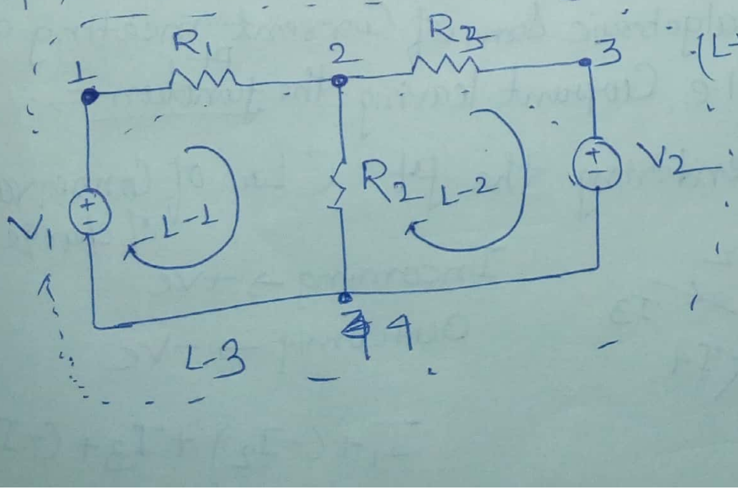
Node → When two or more than two element are Connected together, then common pt is called node

eg



4 node → A, B, C, D

Loop → Any closed path in electrical ckt is called loop

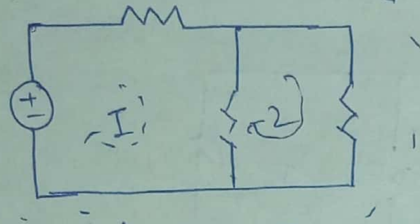


(L→1) 1-2-4-1

Loop 2 → 2-3-4-2

Loop 3 → 1-2-3-4-1

Mesh → A closed path in the Circuit which does not enclose any other closed path inside it. It is applicable for only planar network. Planar n/w is the one that Can be drawn in plane with no-branch Crossing one another



Loop → 3

Mesh → 2

Procedure for applying Mesh analyses

(I) Identify total no. of mesh

(II) Assign the mesh Current

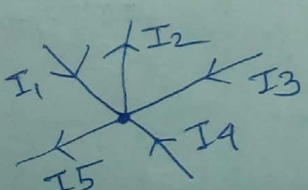
(III) Develop KVL eqn for each mesh

(IV) Solve the eqn to find loop Current

$$E = (B - N + 1)$$

② Kirchhoff's law

(I) KCL → The algebraic sum of Current meeting at pt is zero i.e Current leaving the ~~junction~~ pt = Current entering the pt. (Law of Conservation of charge



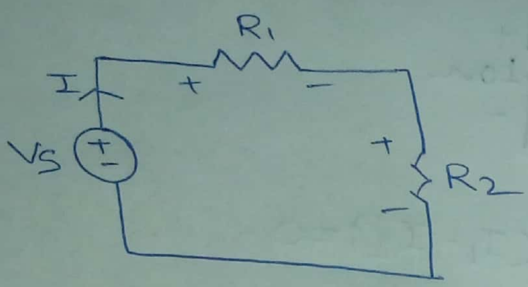
Incoming → +ve

Outcoming → −ve

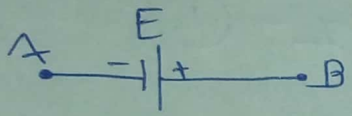
$$I_1 + (-I_2) + I_3 + (-I_4) + I_5 = 0$$

$$I_1 + I_3 + I_5 = I_2 + I_5$$

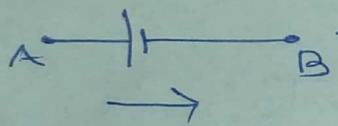
KVL → Algebraic sum of all the voltage in closed loop is zero. Based on law of conservation of energy



Rise in voltage → +ve sign
Fall in voltage → −ve sign



→ −ve to +ve
Rise in potential
V → +ve sign.



→ We go from +ve terminal to −ve terminal
Fall in potential
V → −ve.

or

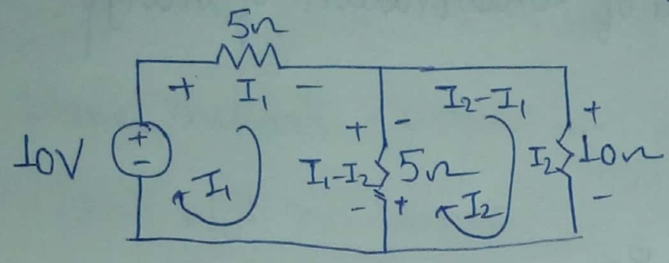
$+V_s - IR_1 - IR_2 = 0$

My 'or
$-V_s + IR_1 + IR_2 = 0$

Rise in potential
⇒ −ve

Drop in poten. → +ve

(Q) Find power loss in 10Ω resistor using mesh analysis



Loop 1 → $-10 + 5I_1 + 5(I_1 - I_2) = 0$

$-10 + 5I_1 + 5I_1 - 5I_2 = 0$

$10I_1 - 5I_2 = 10$

$2I_1 - I_2 = 2$ — ①

L2 $10I_2 + 5(I_2 - I_1) = 0$

$-5I_1 + 15I_2 = 0$

$-I_1 + 3I_2 = 0$ → ② $I_2 = \frac{2}{5}$

$I_2 = I_2^2 \times 10$

$= \left(\frac{2}{5}\right)^2 \times 10$

$P_{10} = \frac{8}{5} \omega$

Classification of electric network

Active n/w → A ckt. which contain atleast one energy source
Voltage or Current source ↳ that capable of providing powergain.

Passive n/w → Only passive element, no energy source

Linear n/w → Parameter alway Constant w.r.t time (Homogenity and additive)

Non-linear n/w →

Bilateral → Ind. of direction of Current

Unilateral → dep on direction of Current

Lumped → physically Separable (seprate element) Small in size

distributed → not physically seperable

Note → Linear element will exhibit bidirect-ond