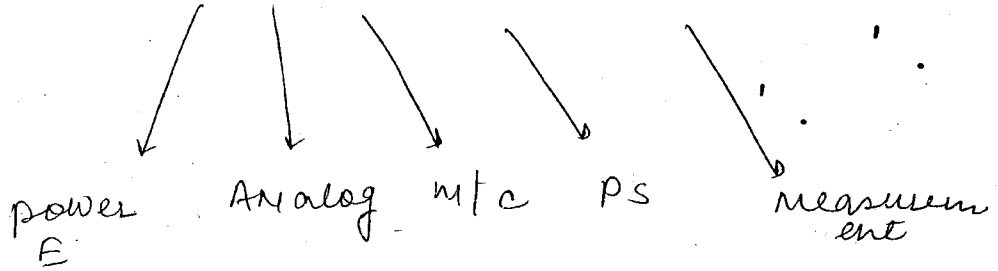


Rishi Chaudhary  
Rishi  
Rishi

Network Theory

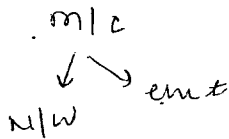
Gate-10 : EE-13  
ECE-19



- Basics
- N/W Theorems
- Transient analysis
- sinusoidal steady state
- 2-Port N/W
- Graph theory
- mago coupled circuit EE

• an interconnection of multiple sub-systems working together as a single system can be called as the N/W.

• in electrical N/W multiple circuit components are connected together



Circuit VS Network

A NW can be a comp<sup>n</sup> of electric components which may or may not have a close path but in a circuit a closed path is required for the flow of electric current.

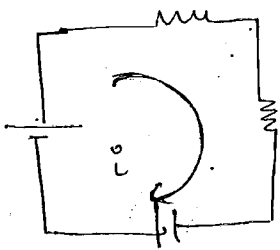
→ So electrical ckt are subset of electrical NW.

circuit VS NW

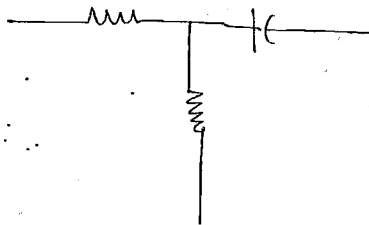
closed path

no such necessity

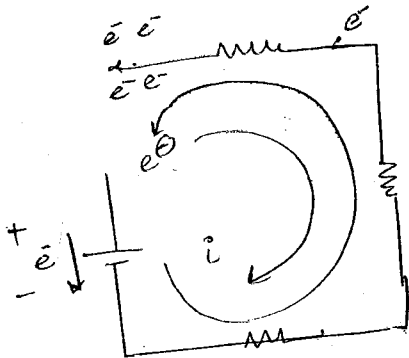
closed path  
हो तो बटिया  
ना हो तो भी  
बटिया



one NW



only network  
not circuit



emf:  $i$  &  $e^-$  opposite  
dir<sup>n</sup> flow वेग है

Q: why closed path is required for the flow of electrical  $i$ ?  
current is the flow of  $e^-$  and  $e^-$  needs a closed path to flow from one terminal of battery to the +ve terminal for charge conservation.

• Within the battery  $e^-$  flow from +ve to -ve terminal by means of a chemical reaction.

main diff b/w battery & capacitor  $\parallel$

Battery की plates के बीच होता है electrolyte की flow होता है & conductivity में।  
Node & Branch

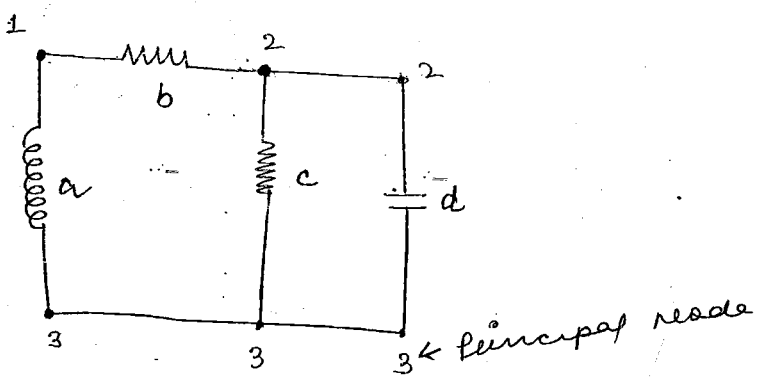
cap plates के बीच कमी है flow नहीं होता bcoz उनके बीच insulator होता है (insulating med)

A node is a point where two or more than two circuit elements are connected together.

A branch is a circuit element connected b/w 2-nodes and is responsible for transferring current and energy b/w the 2-nodes.

in PS Node  $\rightarrow$  Bus

Tx line - Branch



node: 3

branches: 4

• The no. of elements connected to a particular node represents its degree.

degree,  $S_2 = 3$

$S = 2$ , simple node

$S > 2$ , principal node.

path :-

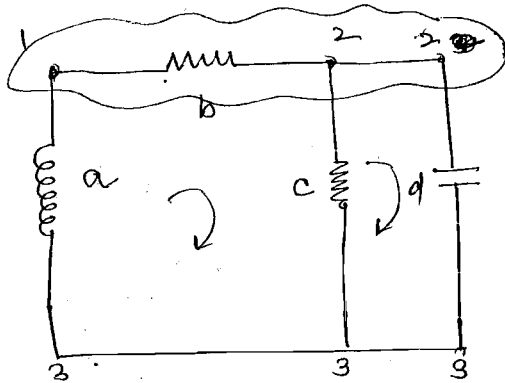
It is a series of nodes through the circuit elements such that no node is crossed twice

• A closed path which starts and terminates at the same point is called as loop.

mesh :-

It is the loop which does not have any more loops inside it.

• A loop which contains multiple loop inside can also be classified as Super mesh.



Super node  $\rightarrow$  multiple node

1231 - loop

02 loop :- 3

mesh :- 2

no. of mesh  $m = b - n + 1$

Gate-10

b - Branch

n - nodes

m - no of mesh

$$b = 4, n = 3$$

$$m = 4 - 3 + 1 = 2$$

Q A NW has 4-mesh and 9 nodes. determine the no of Branches?

$$m = b - n + 1$$

$$4 = b - 9 + 1$$

b = 12