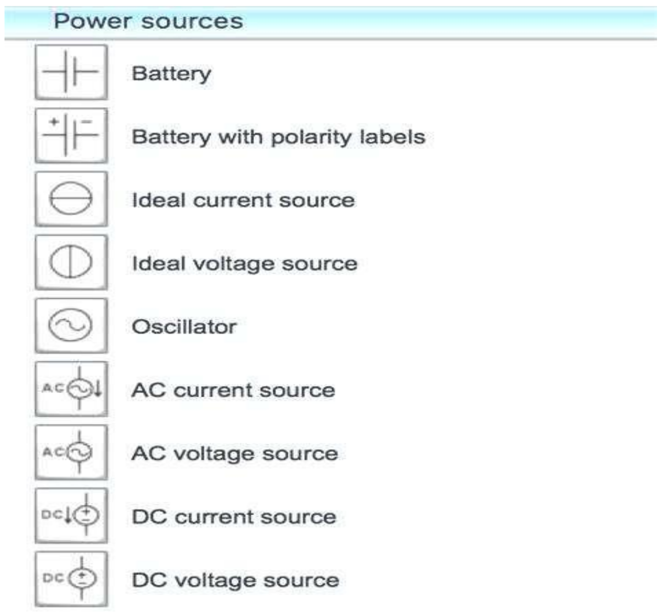
GANDHI SCHOOL OF
ENGINEERING,BHABANDHA,BERHAMPUR

TEACHING AND LEARNING MATERIAL

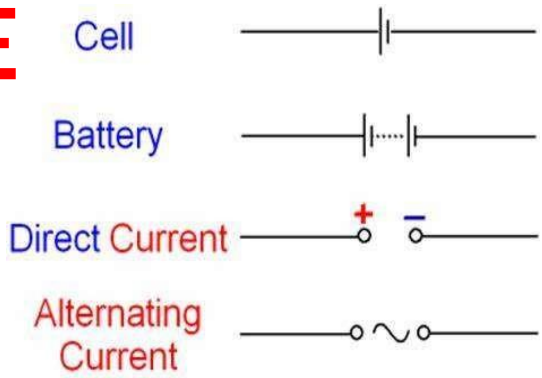
SUBJECT: CIRCUIT NETWORK THEORY
SEMESTER: 3RD

CHAPTER-1

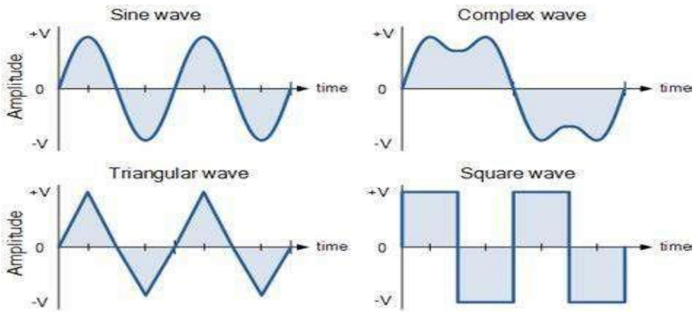
DIFFERENT TYPES OF POWER SOURCE



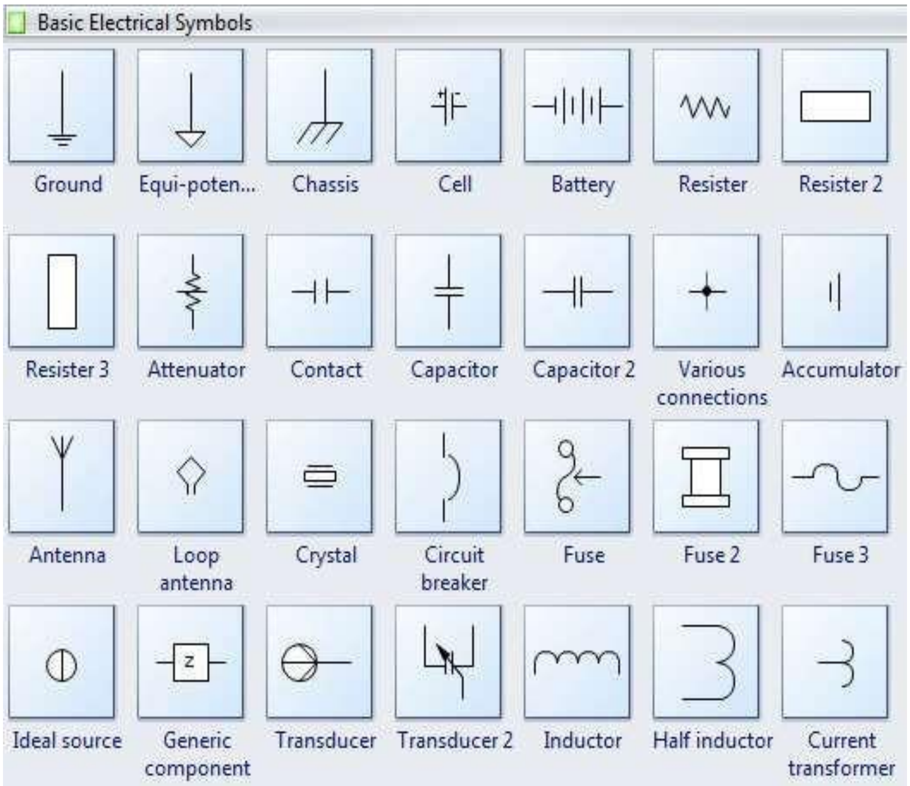
DIFFERENT TYPES OF SOURCE



DIFFERENT TYPES OF WAVE

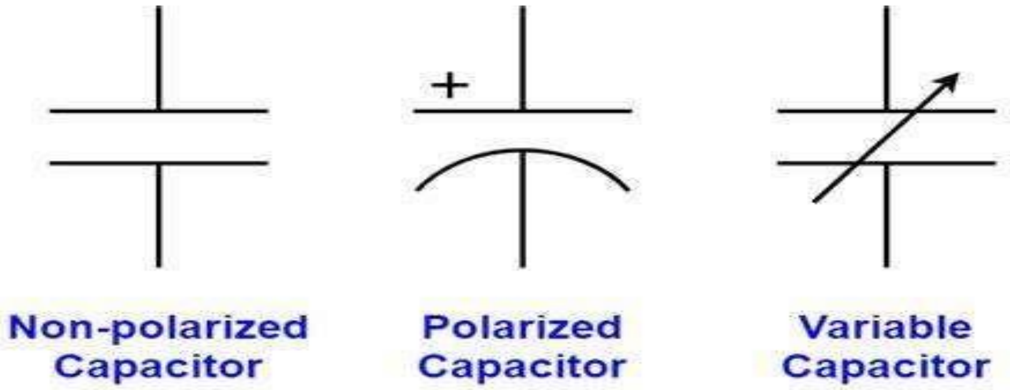


BASIC ELECTRICAL SYMBOLS

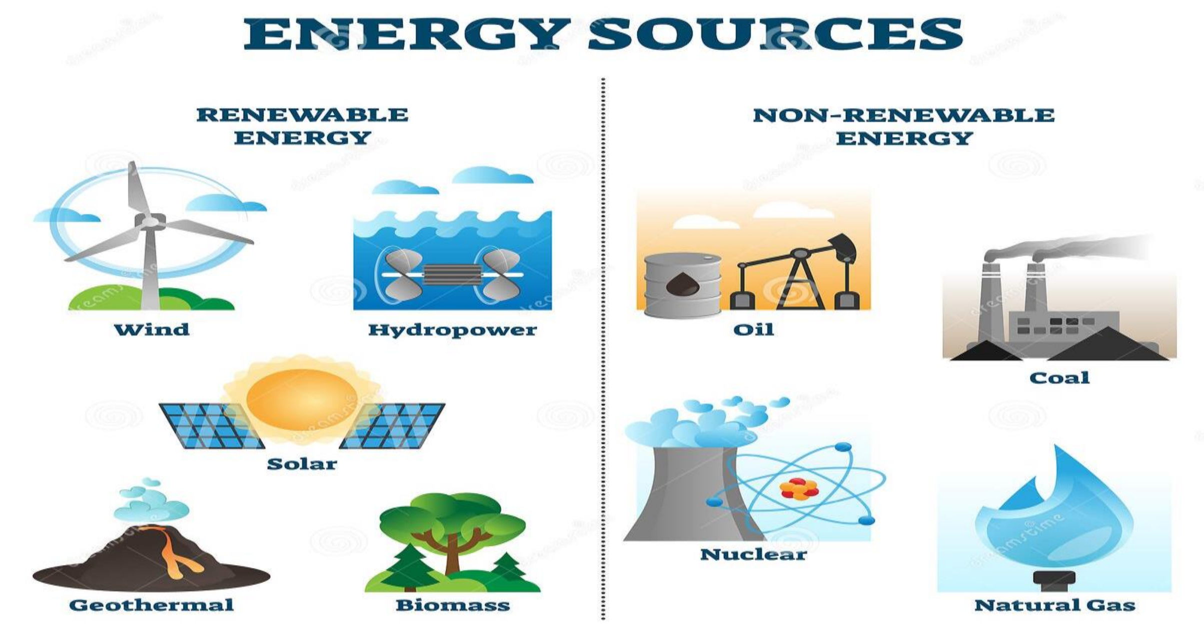


RESISTANCE

DIFFERENT TYPES OF CAPACITOR



CHAPTER-2

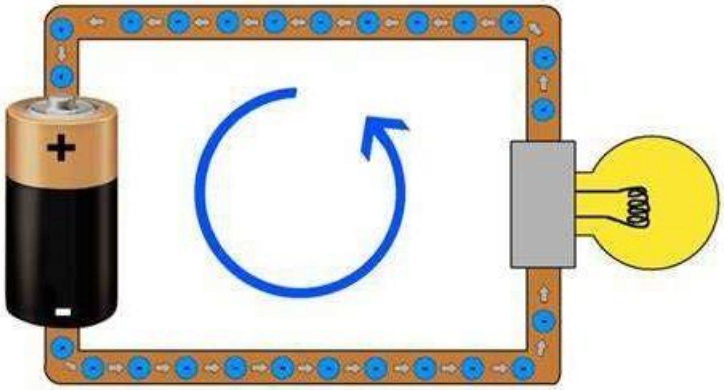


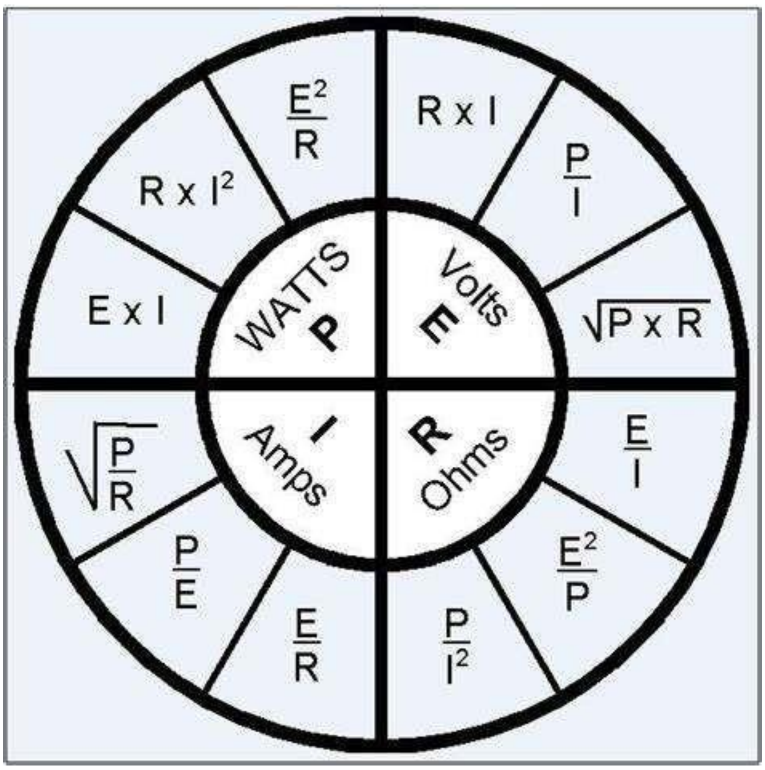
ENERGY SOURCES

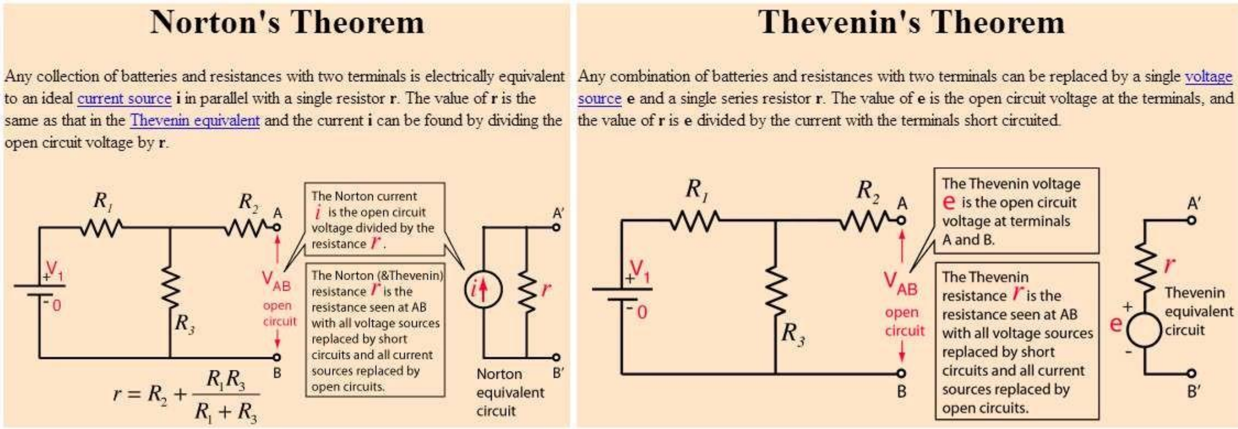
DESERTIFIACATION

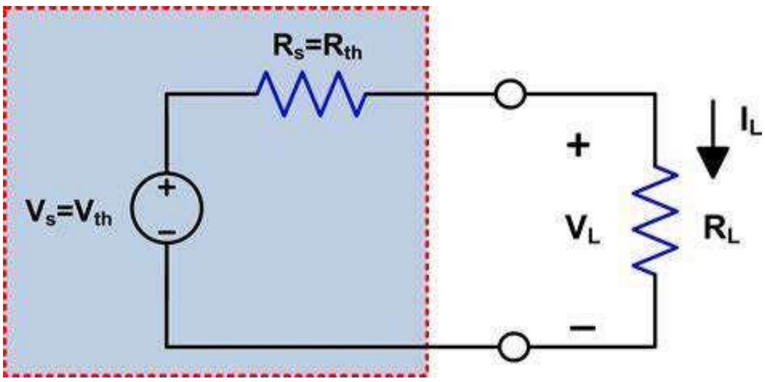
LAND DEGRADATION

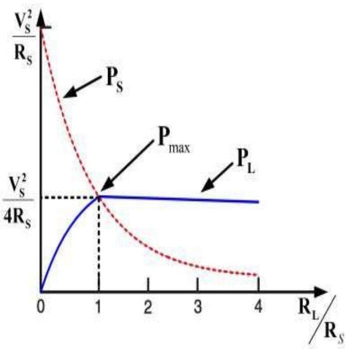
Working of inductor

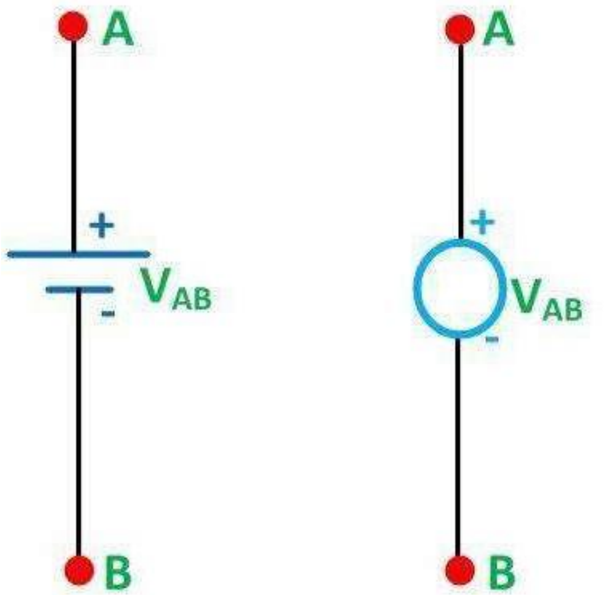




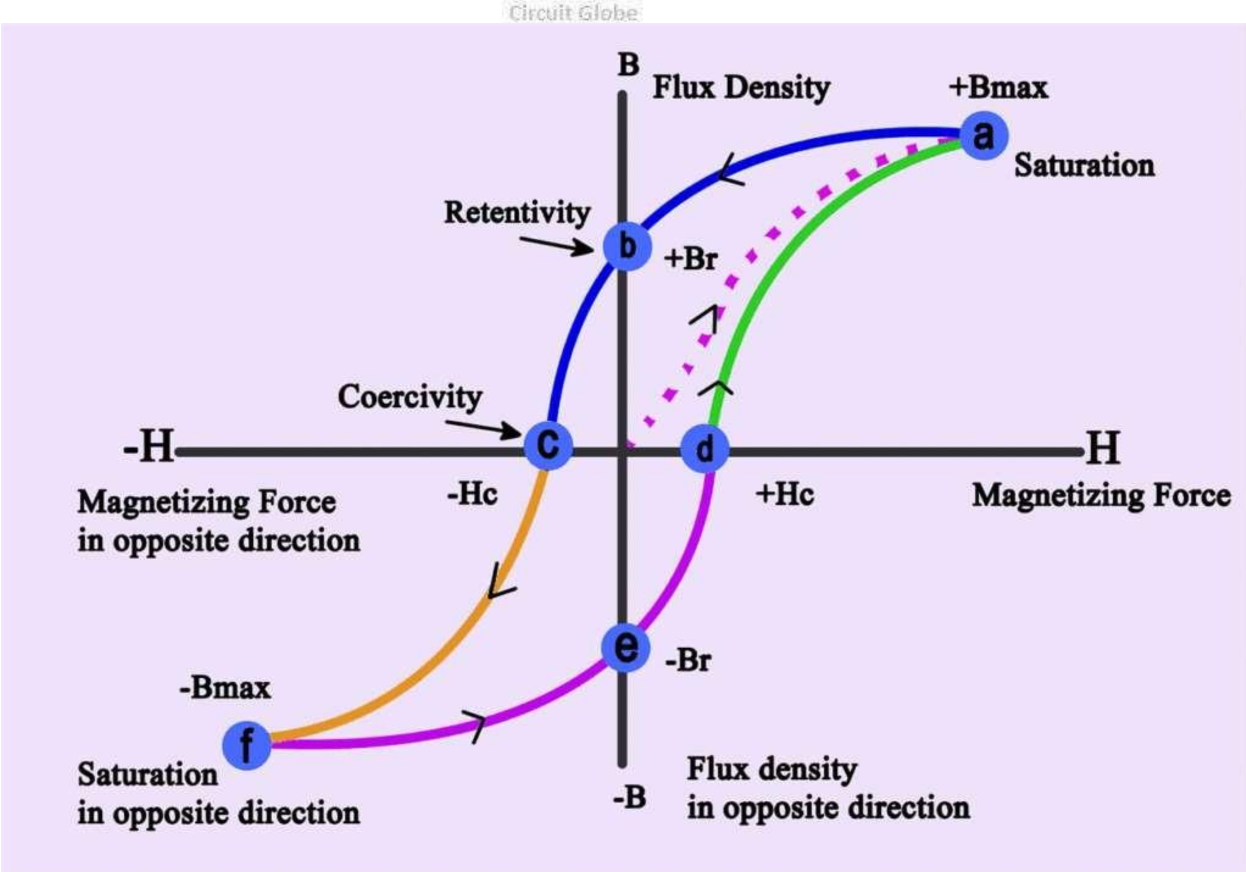

Norton's Theorem
Any collection of batteries and resistances with two terminals is electrically equivalent to an ideal current source i in parallel with a single resistor r. The value of r is the same as that in the Thevenin equivalent and the current i can be found by dividing the open circuit voltage by r.
R1
R2
A
V1
R3
VAB
open circuit
B
The Norton current i is the open circuit voltage divided by the resistance r.
The Norton (&Thevenin) resistance r is the resistance seen at AB with all voltage sources replaced by short circuits and all current sources replaced by open circuits.
A'
B'
i
r
Norton equivalent circuit
$r = R_2 + \frac{R_1R_3}{R_1 + R_3}$
Thevenin's Theorem
Any combination of batteries and resistances with two terminals can be replaced by a single voltage source e and a single series resistor r. The value of e is the open circuit voltage at the terminals, and the value of r is e divided by the current with the terminals short circuited.
R1
R2
A
V1
R3
VAB
open circuit
B
The Thevenin voltage e is the open circuit voltage at terminals A and B.
The Thevenin resistance r is the resistance seen at AB with all voltage sources replaced by short circuits and all current sources replaced by open circuits.
A'
B'
r
e
Thevenin equivalent circuit

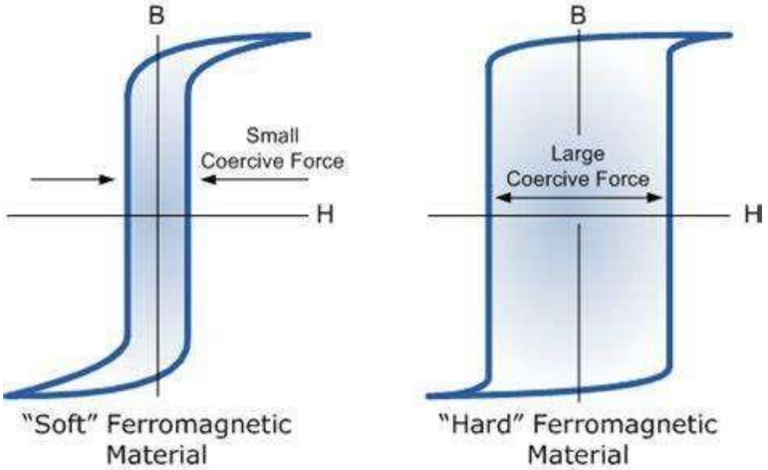

Rs=Rth
Vs=Vth
IL
+
VL
RL
−

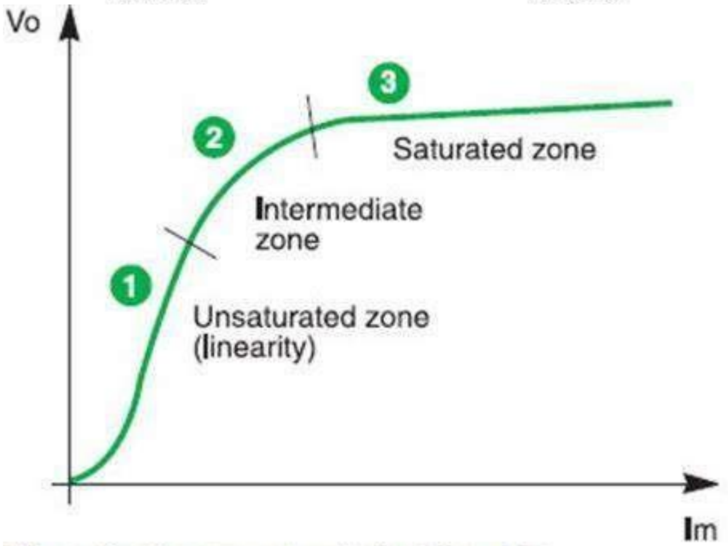

$\frac{V_S^2}{R_S}$
P_S
P_{max}
P_L
$\frac{V_S^2}{4R_S}$
0
1
2
3
4
R_L/R_S



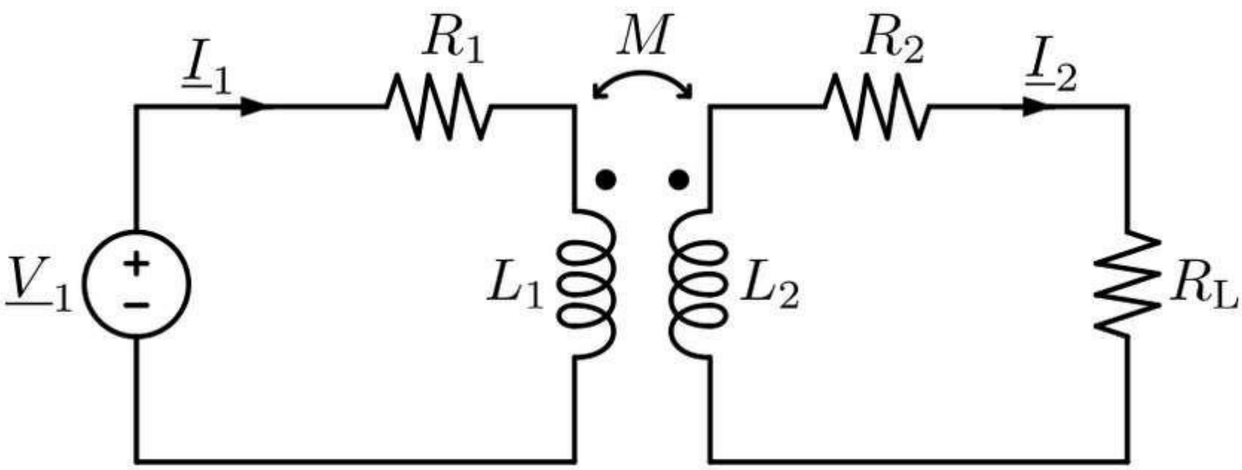
Circuit Globe

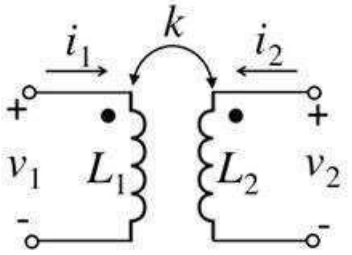






Magnetization curve (excitation) for a CT.
Output voltage as a function of the magnetizing current.
Vo = f (Im)





Time domain:

$$v_1 = L_1 \frac{di_1}{dt} + L_{12} \frac{di_2}{dt}$$

$$v_2 = L_{21} \frac{di_1}{dt} + L_2 \frac{di_2}{dt}$$

Phasor domain:

$$V_1 = j\omega L_1 I_1 + j\omega L_{12} I_2$$

$$V_2 = j\omega L_{21} I_1 + j\omega L_2 I_2$$

where, $L_{12} = L_{12} = \pm k\sqrt{L_1 L_2}$

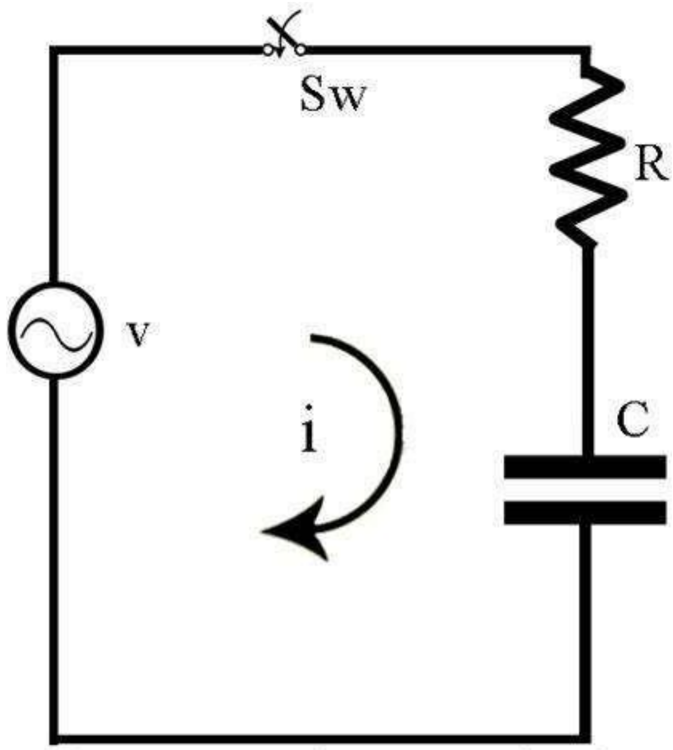
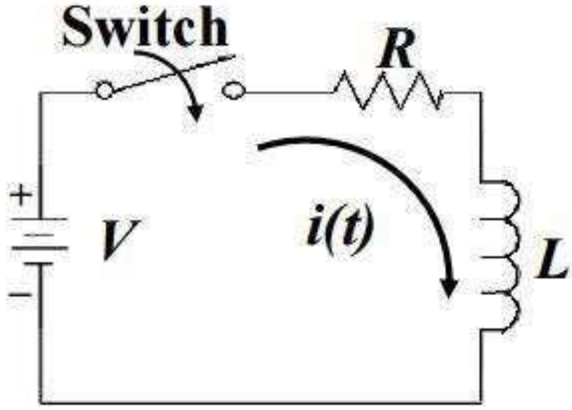
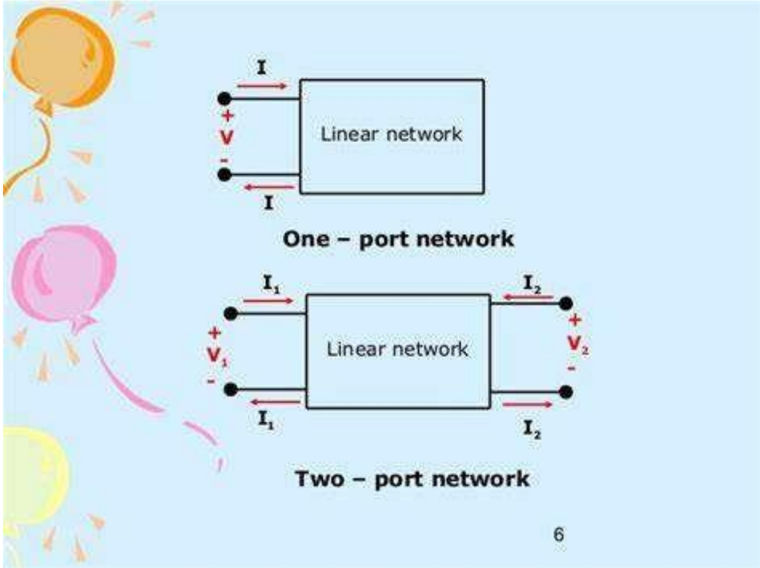


Figure: 1 Series R-C circuit

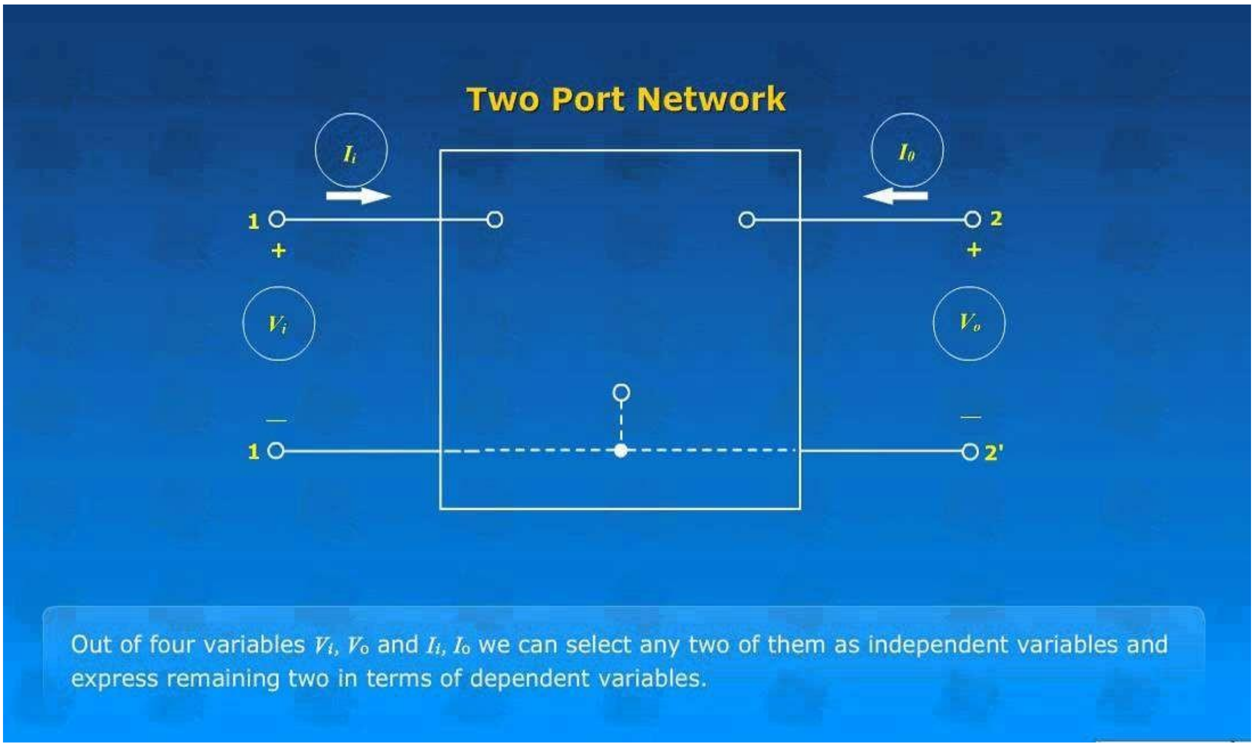


$$v_L(t) = Ve^{-(t/[L/R])} = Ve^{-(R/L)t}$$

CHAPTER -6

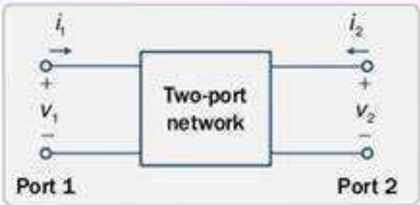


I
+
V
-
Linear network
I
One – port network
I_1
I_2
+
V_1
-
Linear network
+
V_2
-
I_1
I_2
Two – port network
6



Two Port Network
I_i
I_0
1
2
+
+
V_i
V_o
—
—
1
2'
Out of four variables V_i, V_o and I_i, I_o we can select any two of them as independent variables and express remaining two in terms of dependent variables.

Two-port Network Representation



- z-parameter

$$v_1 = z_{11}i_1 + z_{12}i_2$$

$$v_2 = z_{21}i_1 + z_{22}i_2$$

$$\begin{bmatrix} v_1 \\ v_2 \end{bmatrix} = \begin{bmatrix} z_{11} & z_{12} \\ z_{21} & z_{22} \end{bmatrix} \begin{bmatrix} i_1 \\ i_2 \end{bmatrix}$$

- y-parameter

$$\begin{bmatrix} i_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} y_{11} & y_{12} \\ y_{21} & y_{22} \end{bmatrix} \begin{bmatrix} v_1 \\ v_2 \end{bmatrix}$$

- h-parameter

$$\begin{bmatrix} v_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{bmatrix} \begin{bmatrix} i_1 \\ v_2 \end{bmatrix}$$

- ABCD parameters

$$\begin{bmatrix} v_1 \\ i_1 \end{bmatrix} = \begin{bmatrix} A & B \\ C & D \end{bmatrix} \begin{bmatrix} v_2 \\ -i_2 \end{bmatrix}$$