GANDHI SCHOOL OF ENGINEERING,BHABANDHA,BERHAMPUR

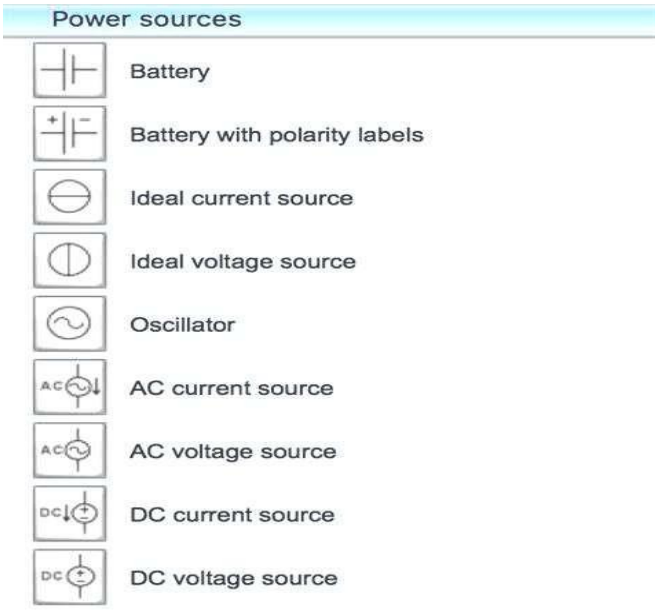
TEACHING AND LEARNING MATERIAL

SUBJECT: CIRCUIT THEORY

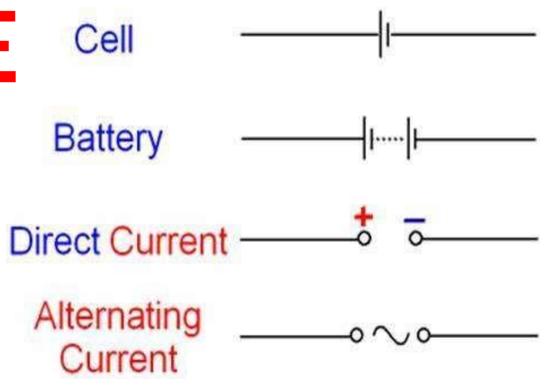
SEMESTER: 3RD

CHAPTER-1

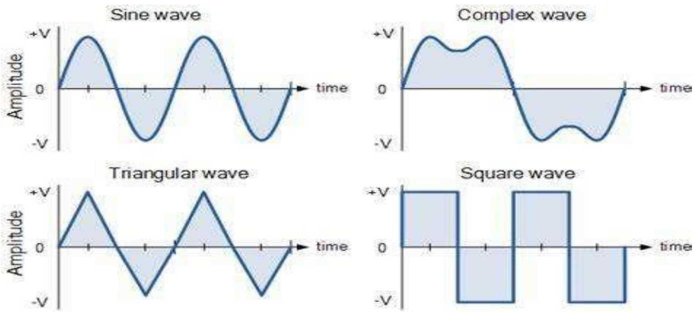
DIFFERENT TYPES OF POWER SOURCE



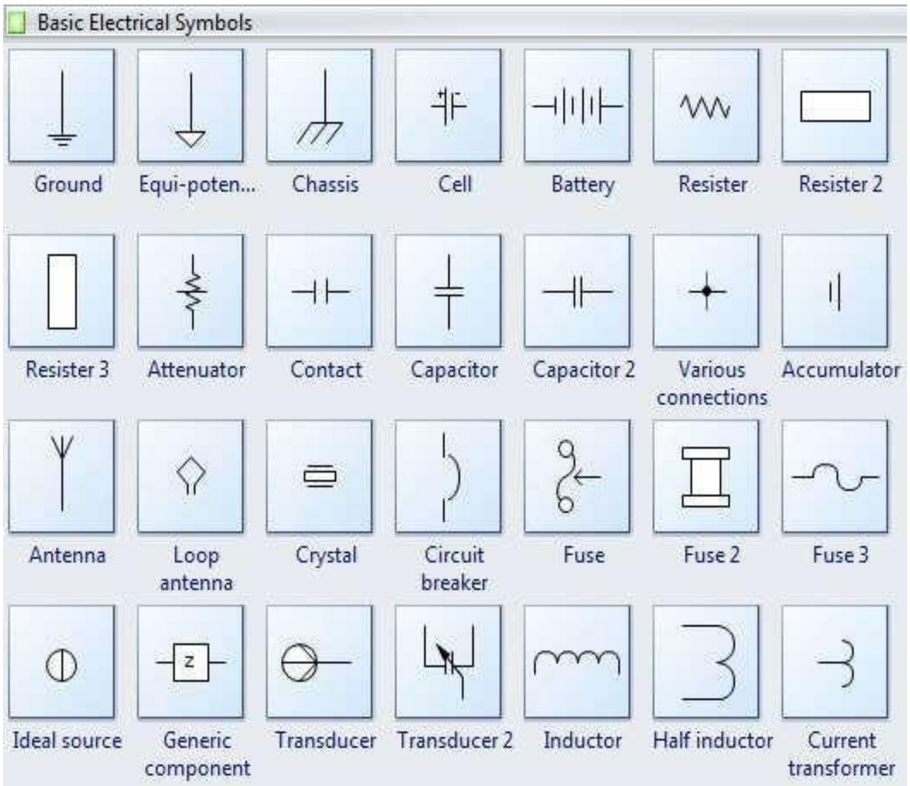
DIFFERENT TYPES OF SOURCE



DIFFERENT TYPES OF WAVE

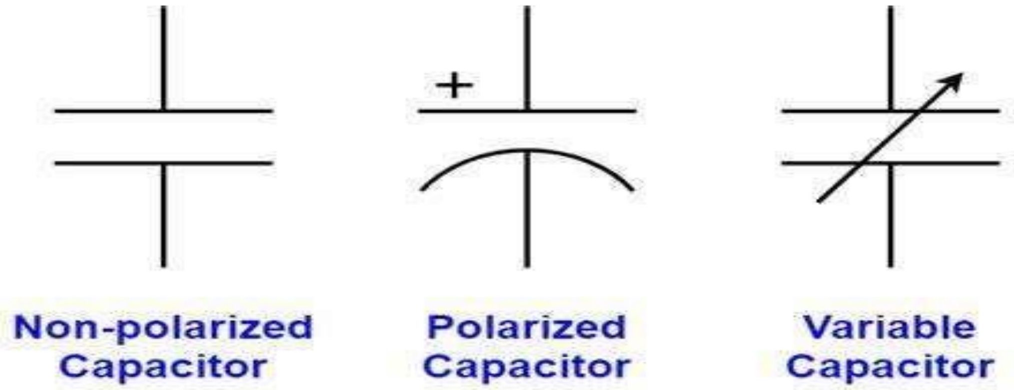


BASIC ELECTRICAL SYMBOLS

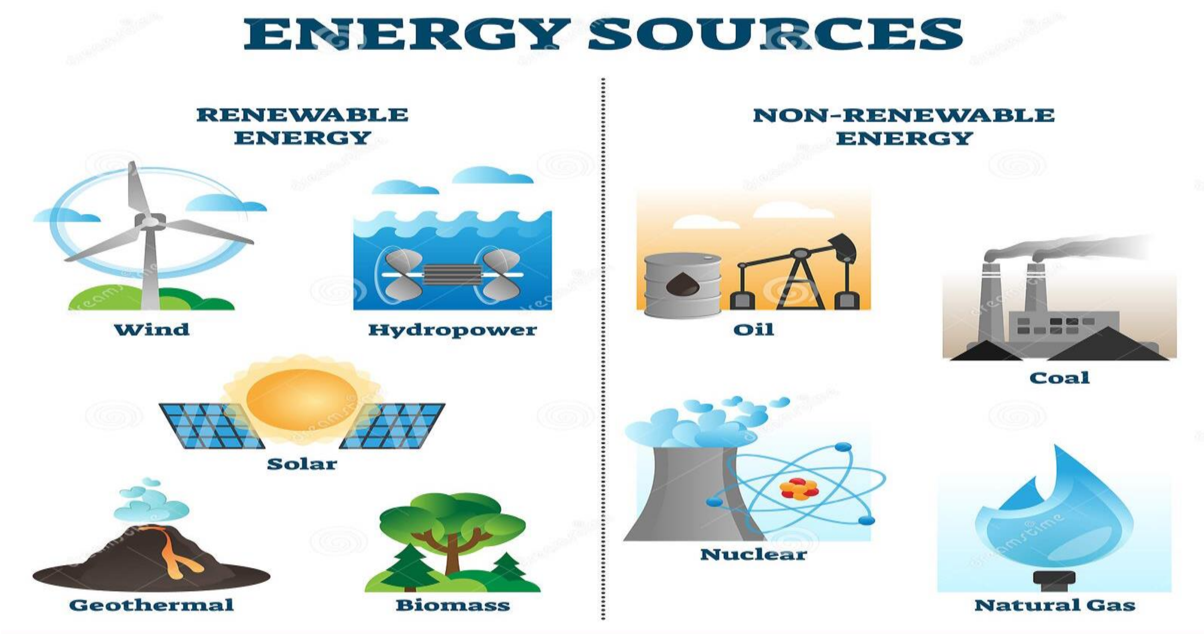


RESISTANCE

DIFFERENT TYPES OF CAPACITOR



CHAPTER-2

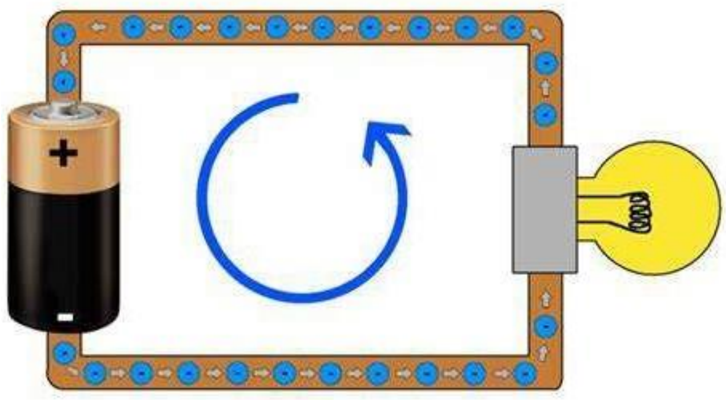


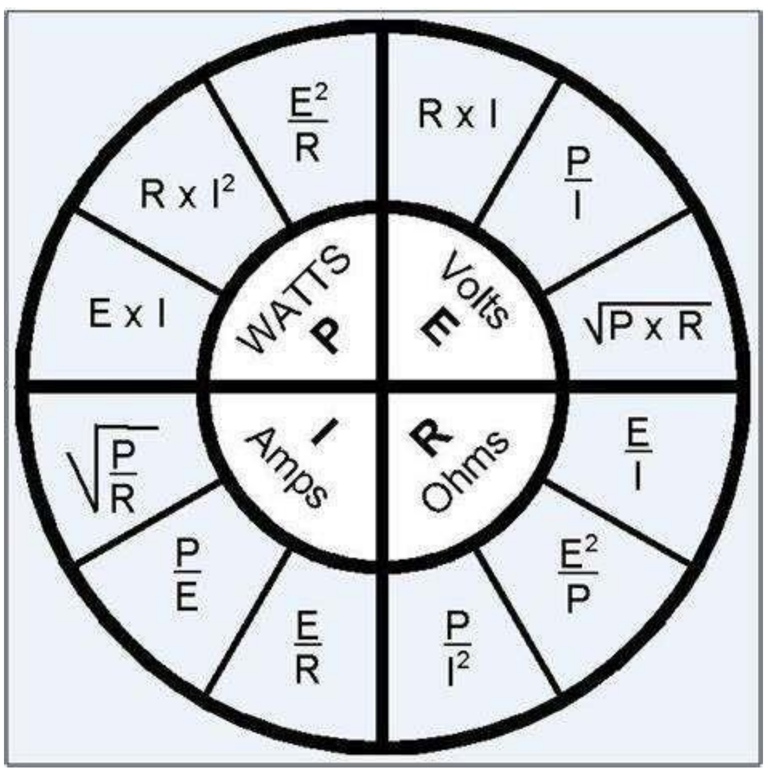
ENERGY SOURCES

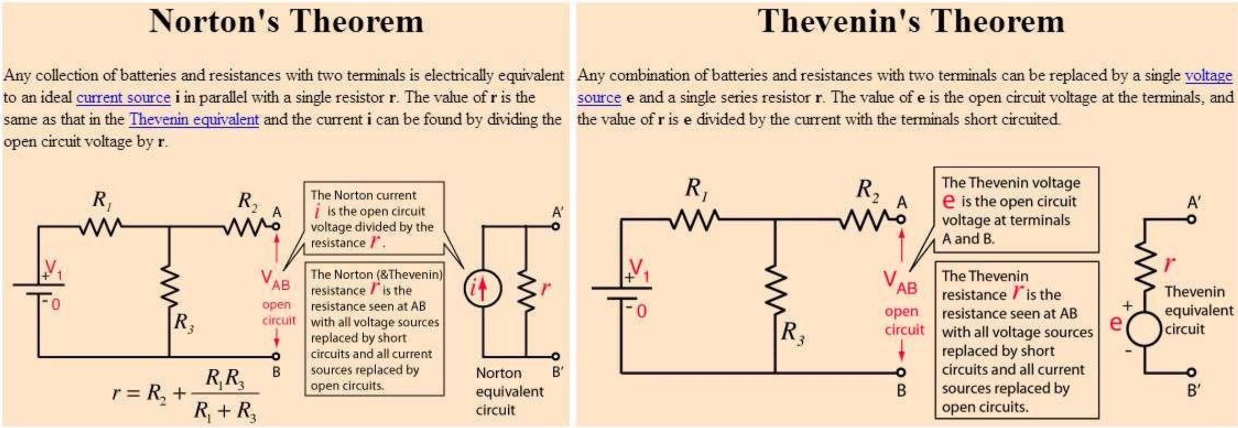
DESERTIFIACATION

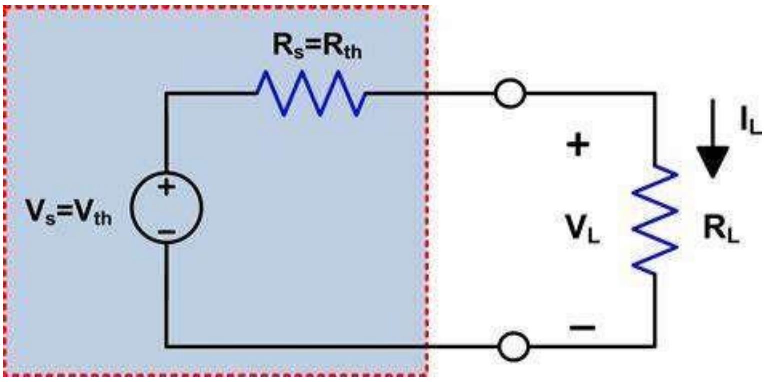
LAND DEGRADATION

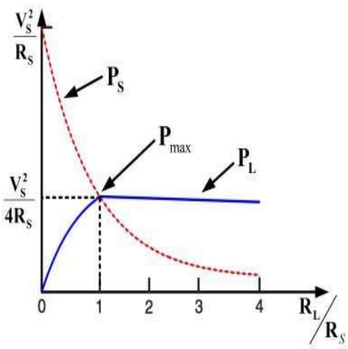
Working of inductor

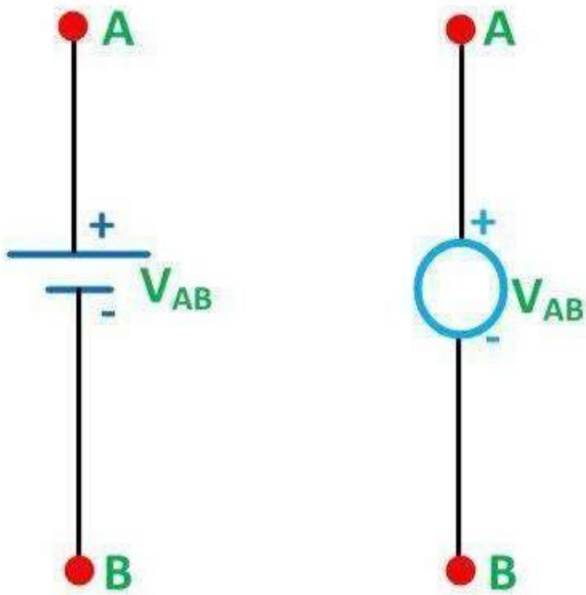


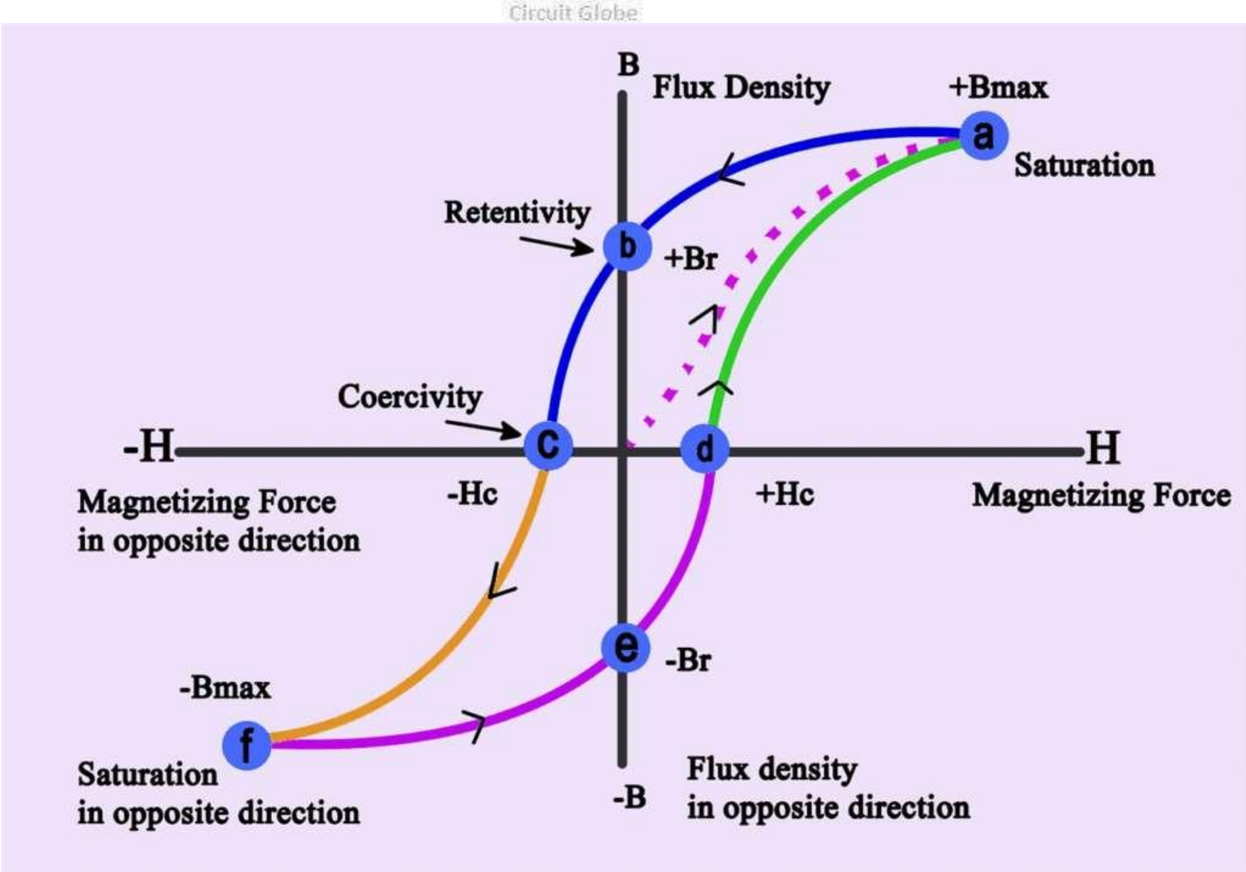


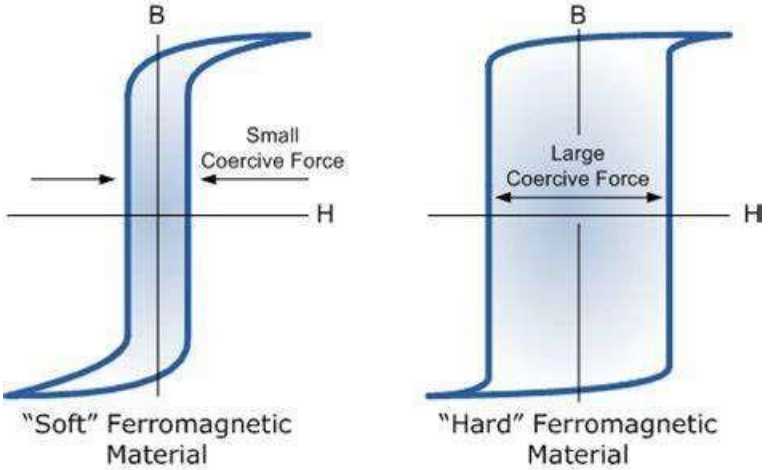

Norton's Theorem
Any collection of batteries and resistances with two terminals is electrically equivalent to an ideal current source i in parallel with a single resistor r. The value of r is the same as that in the Thevenin equivalent and the current i can be found by dividing the open circuit voltage by r.
R1
R2
A
V1
0
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'
i
r
B'
Norton equivalent circuit
r = R2 + R1R3/(R1 + R3)
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
0
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'
r
e
Thevenin equivalent circuit
B'

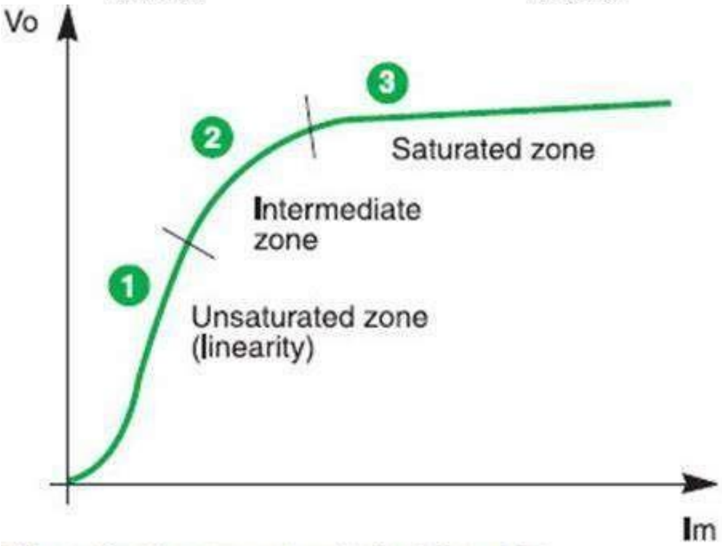

Rs=Rth
Vs=Vth
IL
VL
RL


Vs²/Rs
Ps
Pmax
PL
Vs²/4Rs
0
1
2
3
4
RL/Rs

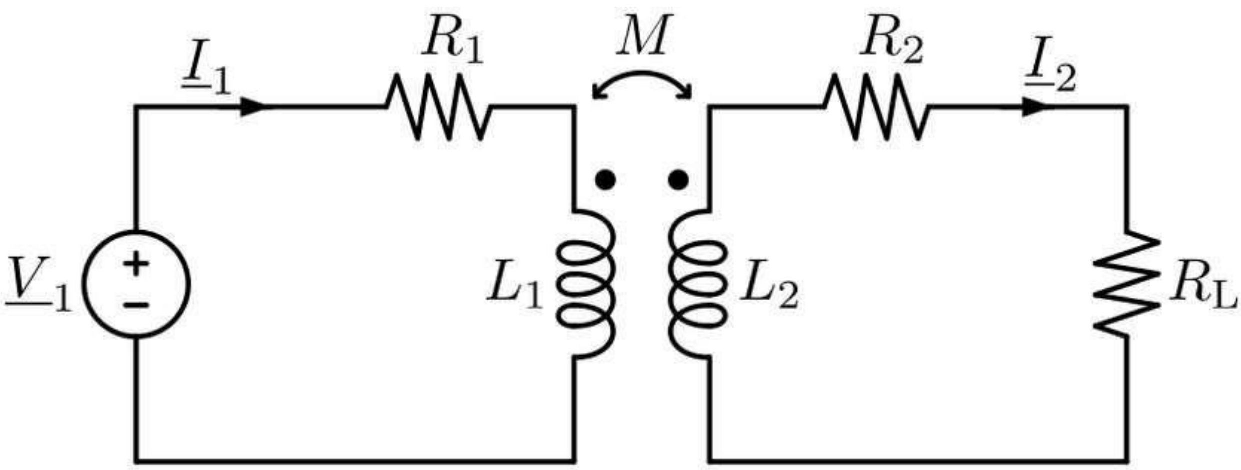

A
+
V_AB
-
B
A
+
V_AB
-
B

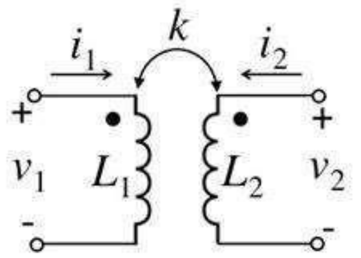

B
Flux Density
+Bmax
a
Saturation
Retentivity
b
+Br
Coercivity
c
d
-H
H
Magnetizing Force
in opposite direction
-Hc
+Hc
Magnetizing Force
e
-Br
-Bmax
f
Saturation
in opposite direction
-B
Flux density
in opposite direction





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

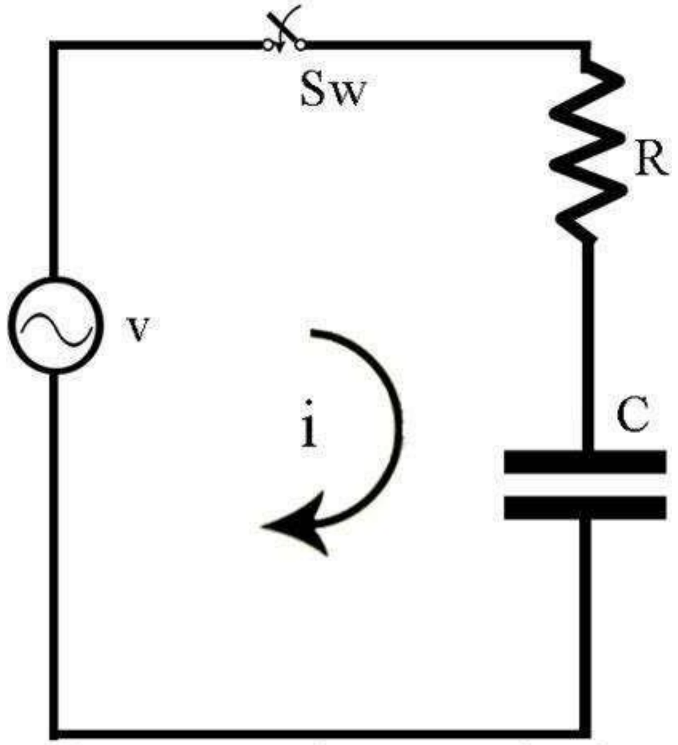
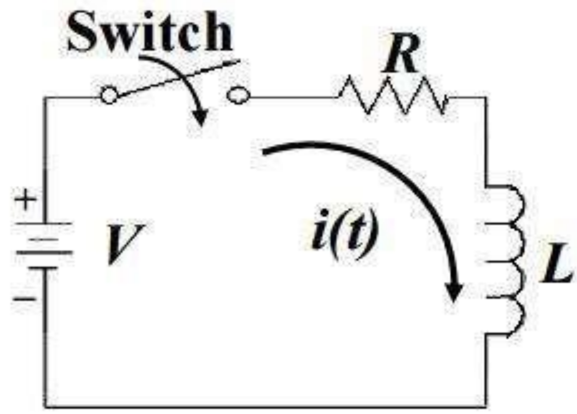
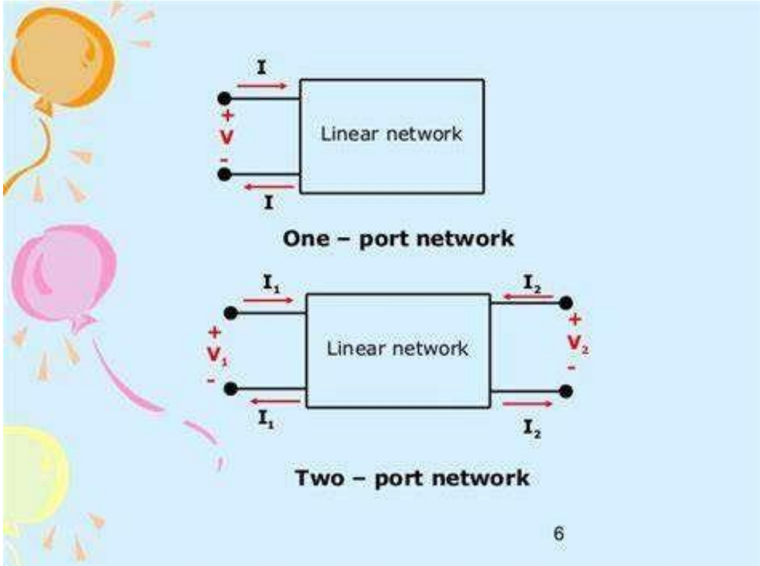


Figure: 1 Series R-C circuit

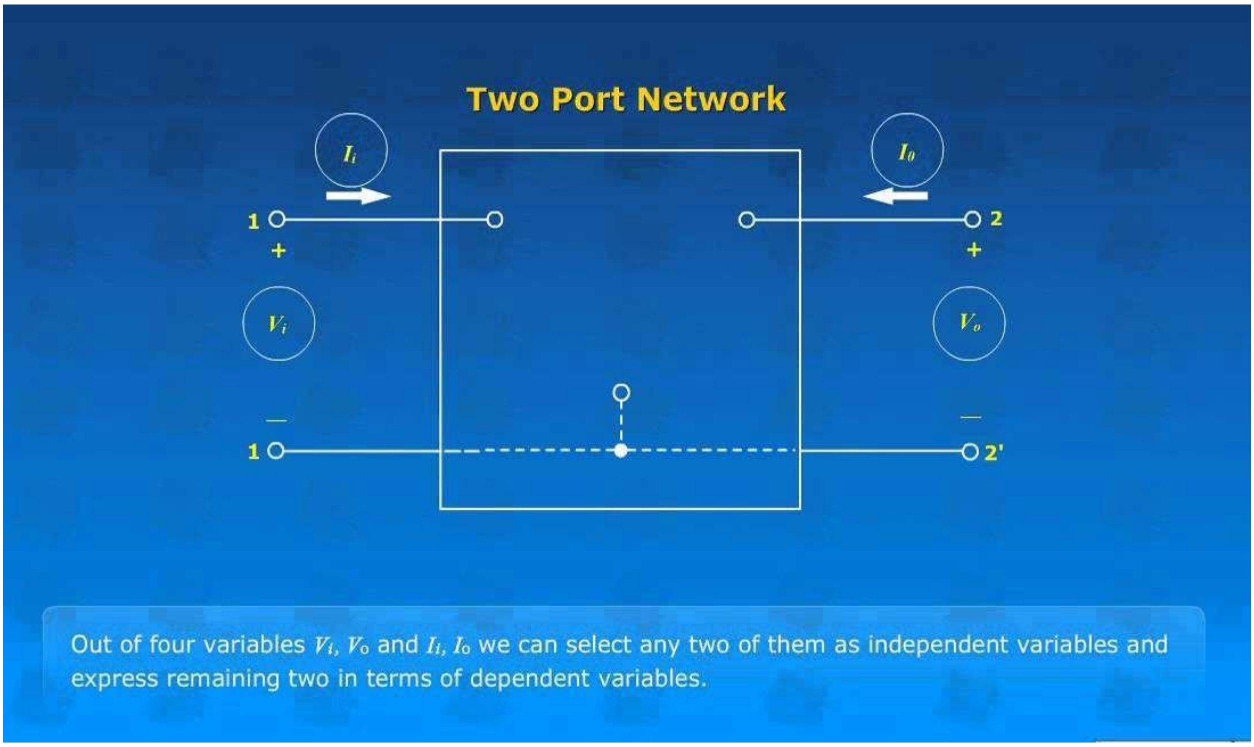


$$v_L(t) = Ve^{-(t/[L/R])} = Ve^{-(R/L)t}$$

CHAPTER -6

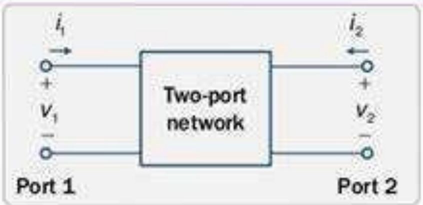


I
+
V
-
Linear network
I
One – port network
I1
I2
+
V1
-
Linear network
+
V2
-
I1
I2
Two – port network
6



Two Port Network
Ii
Io
1
2
+
+
Vi
Vo
—
—
1
2'
Out of four variables Vi, Vo and Ii, Io 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**

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