WELCOME

TO Adda247

"STEADY STATE IS JUST AN ILLUSION."

Chapter – 2

DC Transient and Steady State analysis

Passive Elements.

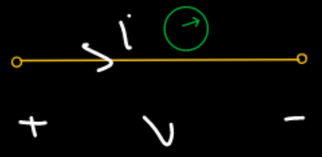
1.Inductor
2.Capacitor
3.Resistor

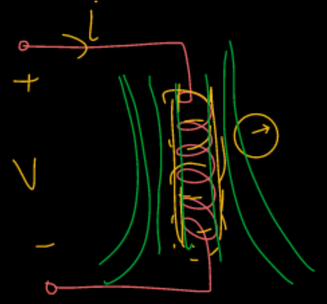
Adda-247 → App
↳ Instll

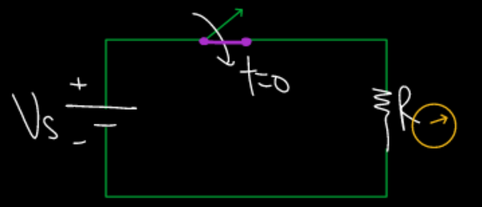
Passive Elements.

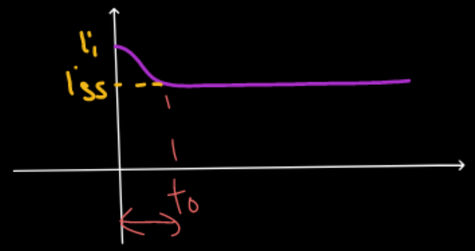
1.Inductor

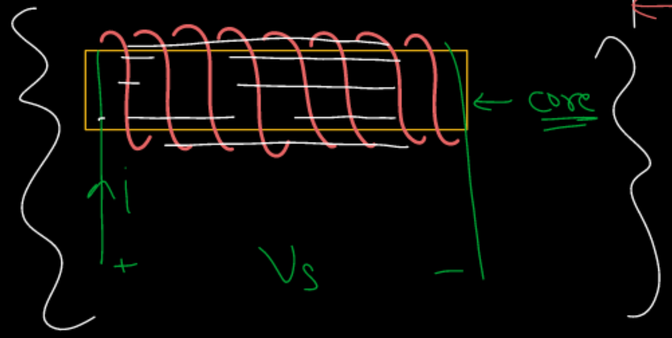
Faraday Law of induction:-





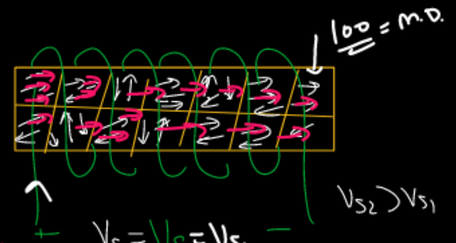




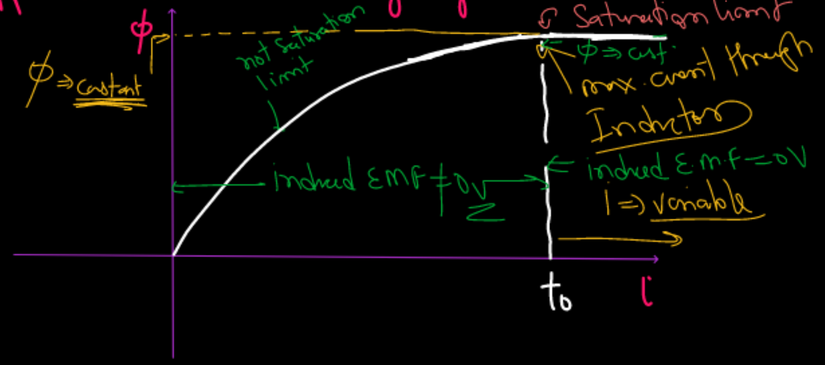


⇒ Inductor

Inductor energized by D.C. supply.



* mag. dipoles Alignment, is the main reason to opposes the sudden change of current.



F. L. of Induction $\Rightarrow$

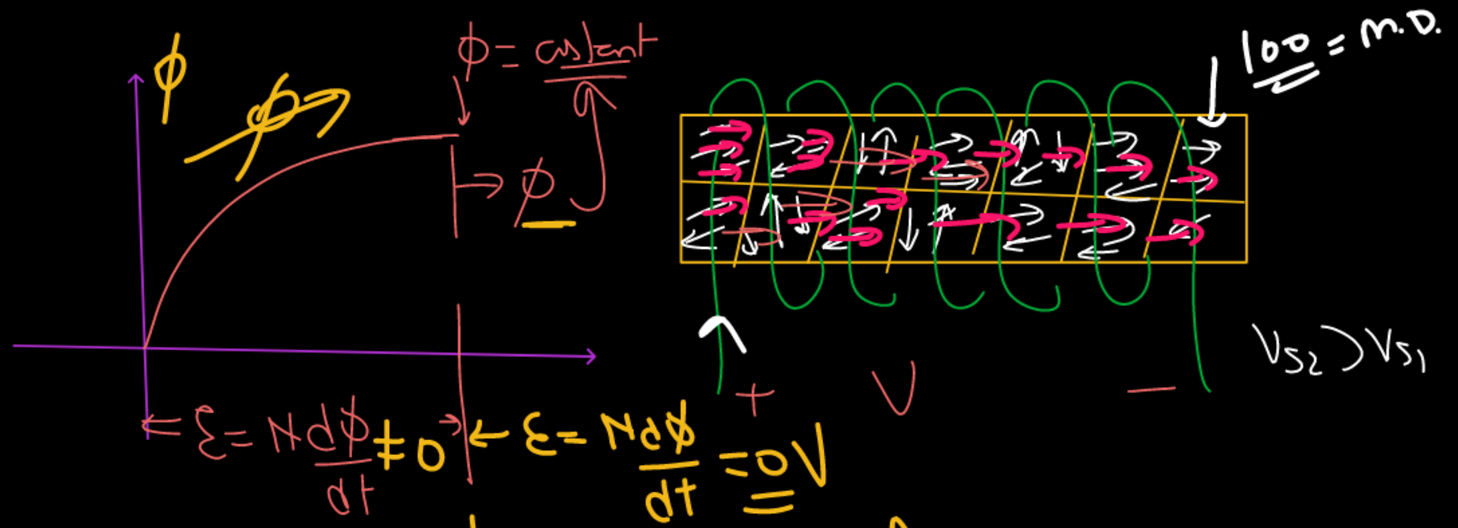
$$\left[\mathcal{E} = -N \frac{d\phi}{dt}\right] \Rightarrow \text{Variably}$$

induced EMF

if, $i \nearrow$ then $\phi \nearrow$

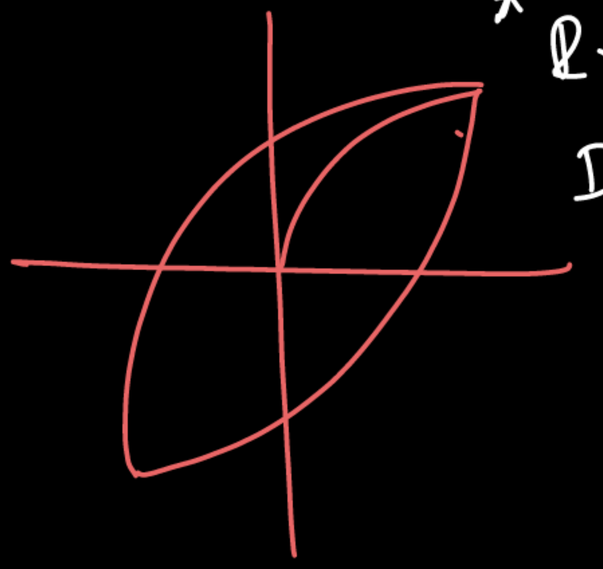
* if we will operat inductor beyond saturation limit, our inductor will get damaged.

Why inductors will be S/C in D.C. ckt :→

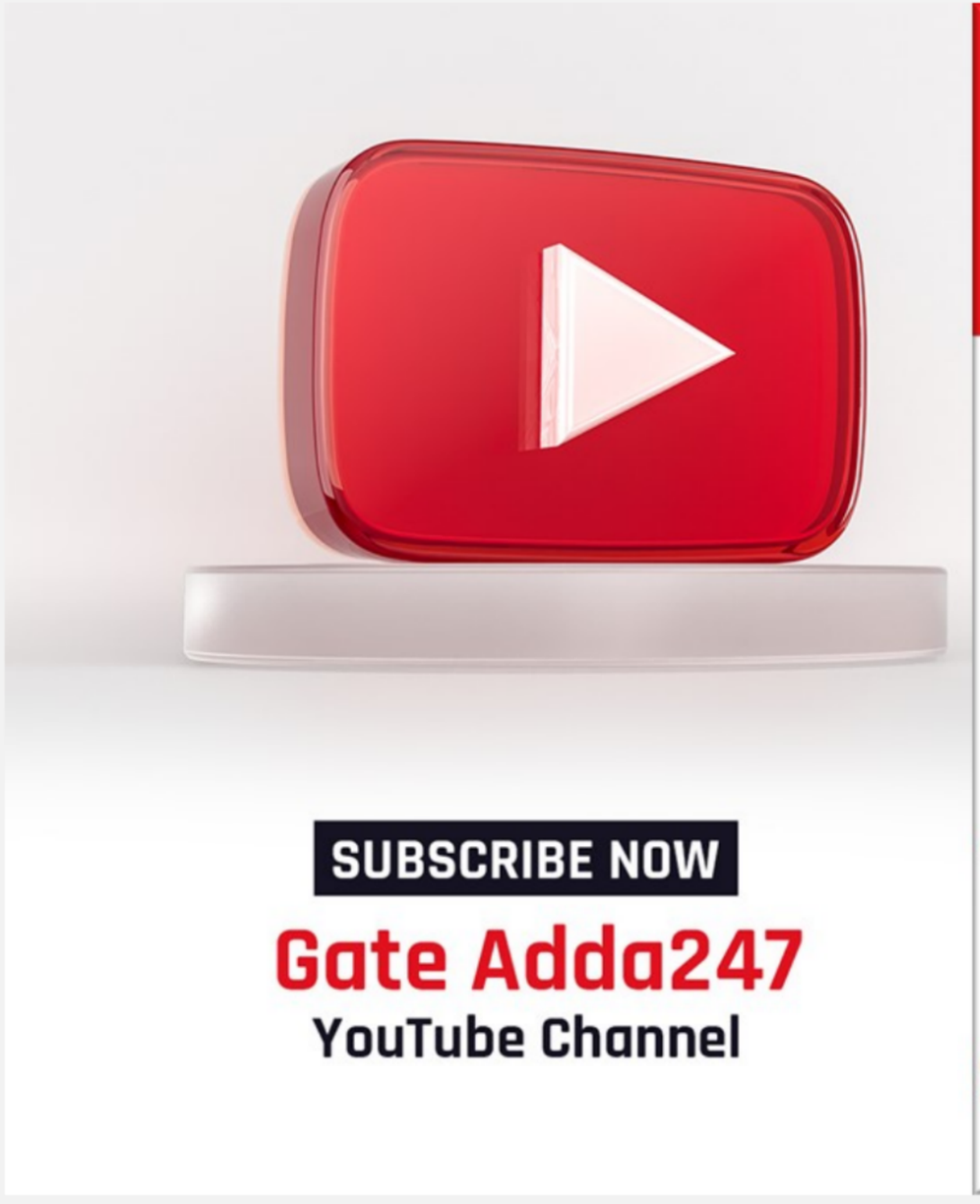


⇐ S/C case of inductor.

* A charged inductor will be S/C in D.C. ckt.



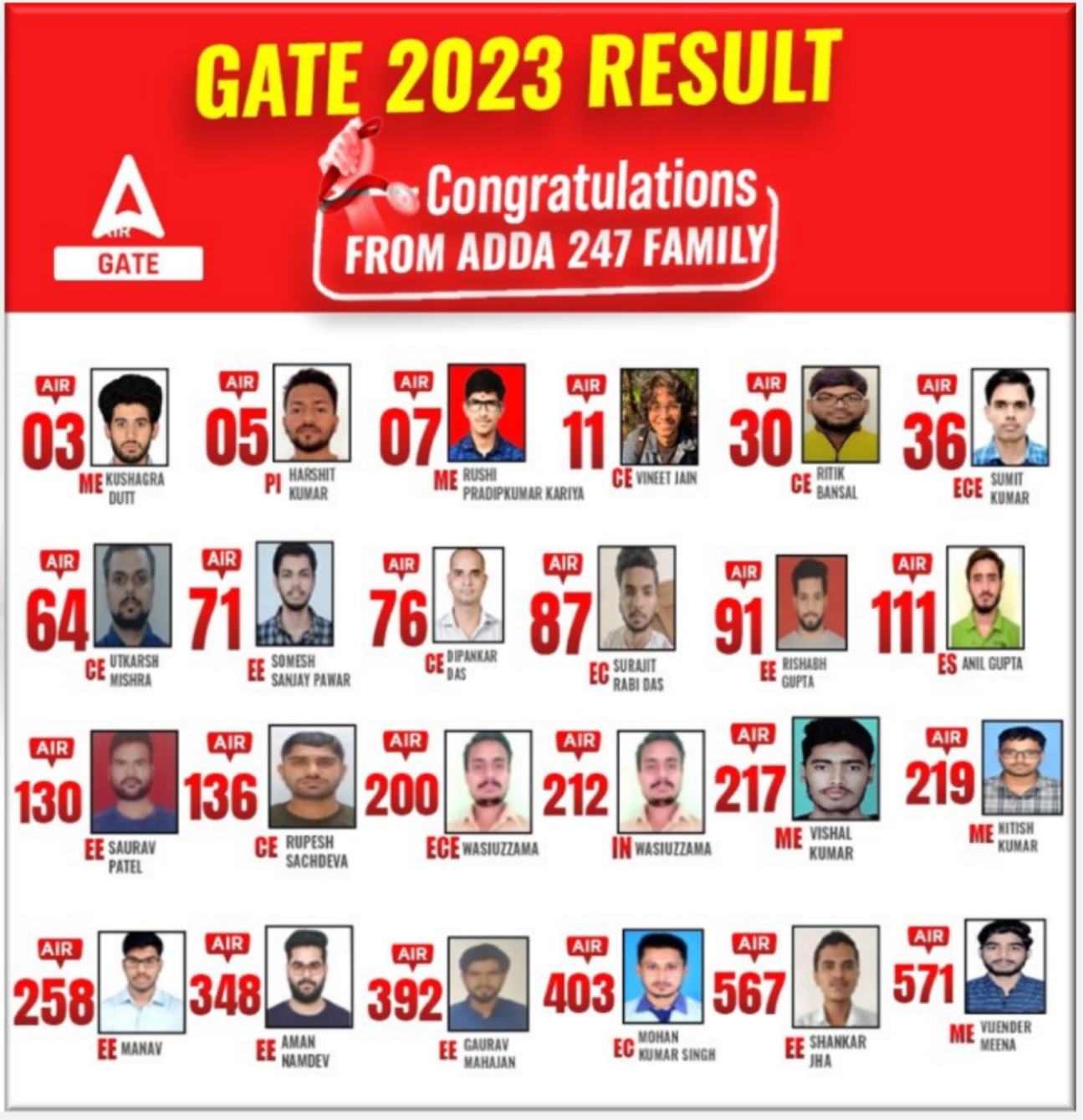
* In A.C. ckt, Inductor will not be O/C or S/C



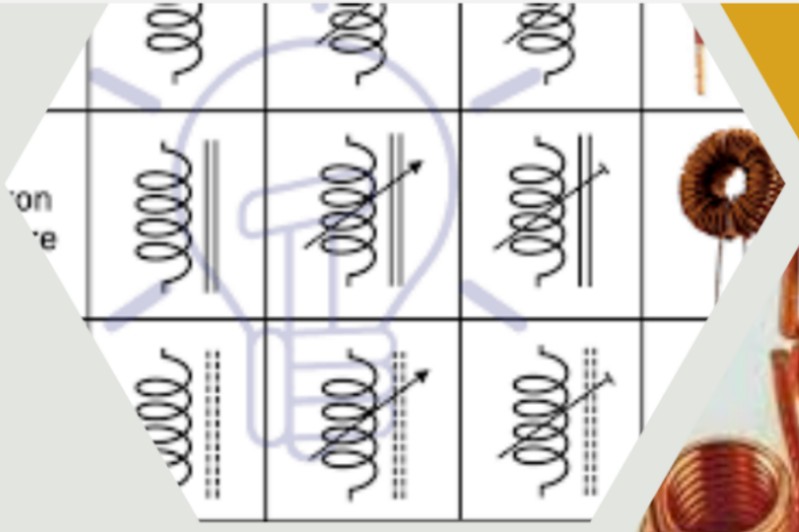
GATE 2023 RESULT

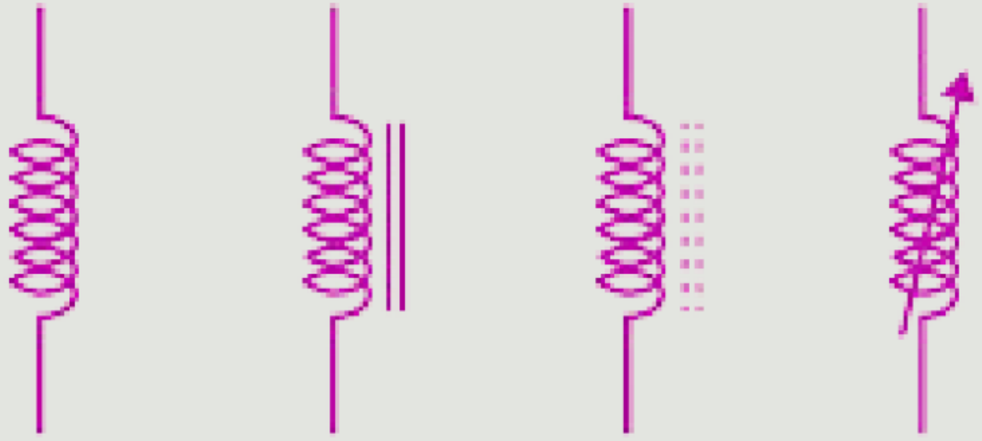
GATE

Congratulations
FROM ADDA 247 FAMILY



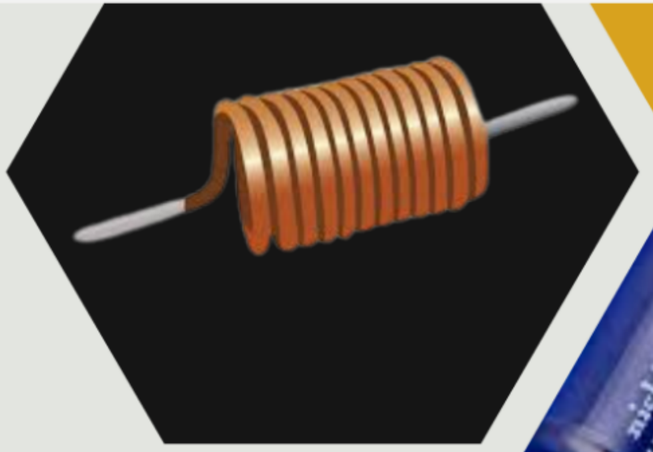
GATE 2024





Adda 247

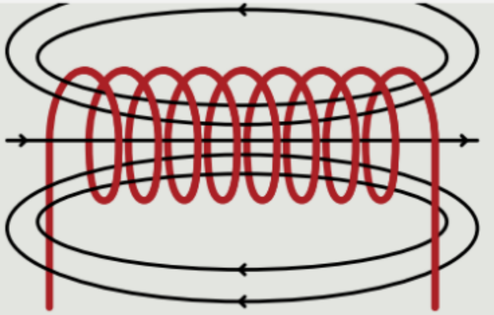
WELCOME TO GATE ADDA 247



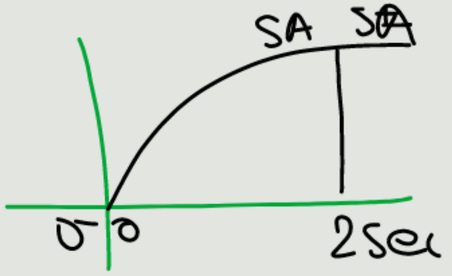
TODAY TOPIC IS

INDUCTOR

PROPERTIES OF INDUCTOR



1. INDUCTOR IS PASSIVE & ENERGY STORING ELEMENT

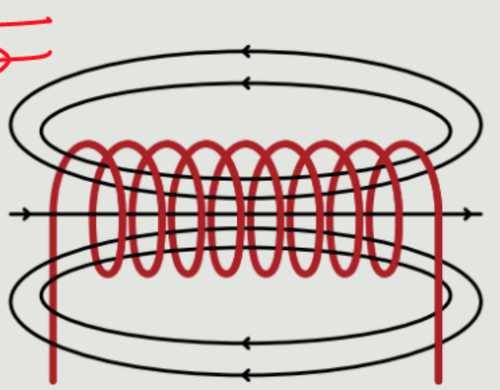


2. IT IS BILATERAL ELEMENT

3. INDUCTOR DOES NOT ALLOW SUDDEN CHANGE OF MAGNITUDE OF CURRENT

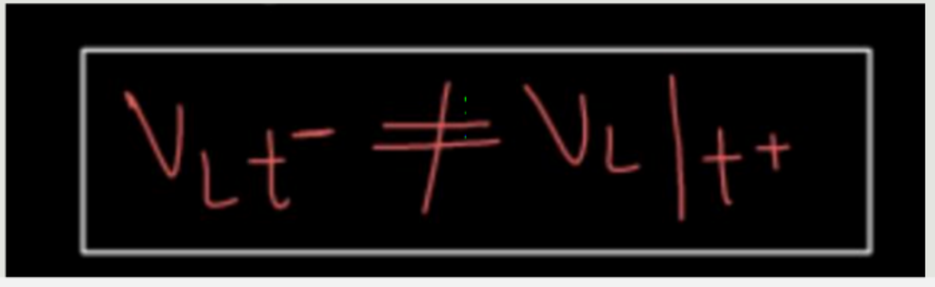
$$i_L\Big|_{t^-} = i_L\Big|_{t^+}$$

PROPERTIES OF INDUCTOR



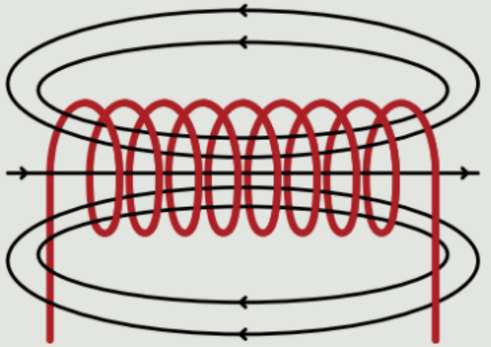
4 INDUCTOR DOES NOT ALLOW SUDDEN CHANGE OF DIRECTION OF CURRENT

5 INDUCTOR'S VOLTAGE MAGNITUDE CAN CHANGE SUDDENLY

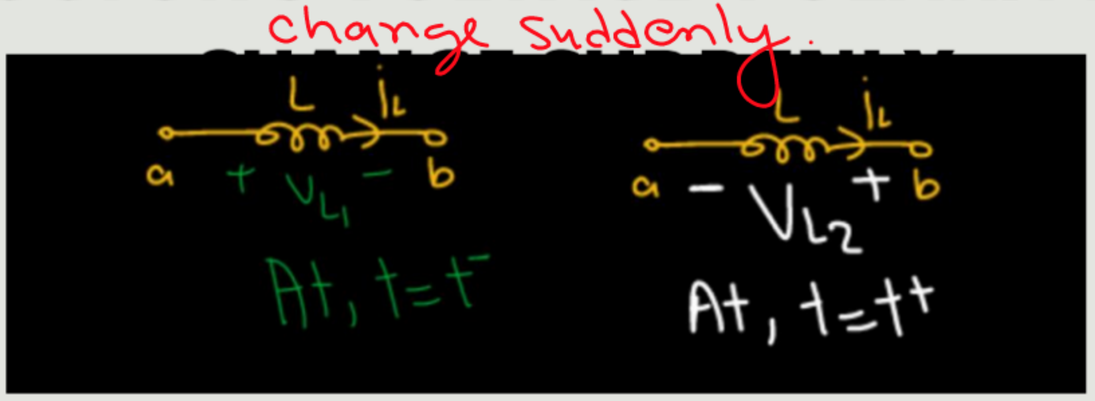


$V_L|_{t=2sec} = 10V$, $V_L|_{t=2^+sec} = +1000V$

PROPERTIES OF INDUCTOR

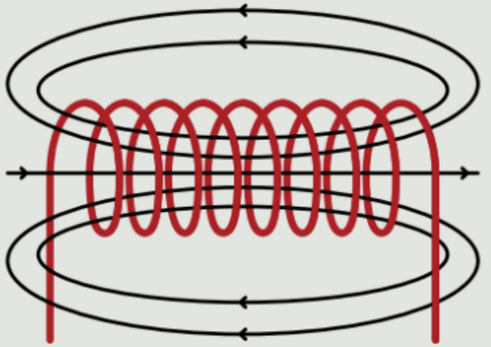


6 INDUCTOR'S VOLTAGE POLARITY CAN

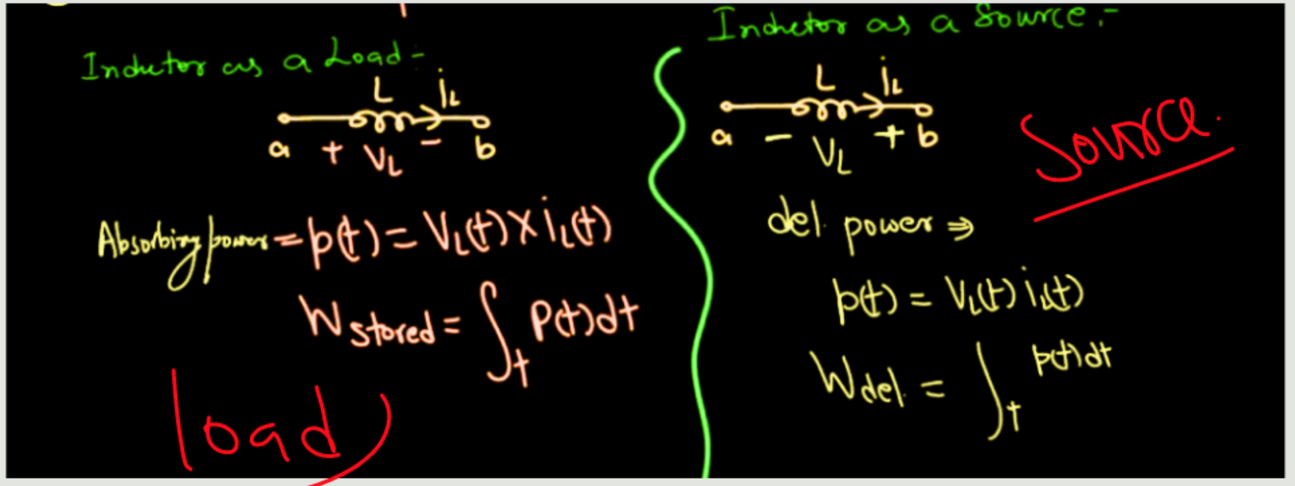


7 AN INDUCTOR CAN STORE ENERGY AND IT CAN DELIVER ACCORDING TO CIRCUIT NEED. SO INDUCTOR CAN BEHAVES AS A SOURCE OR LOAD DEPENDING UPON CIRCUIT CONDITION

PROPERTIES OF INDUCTOR

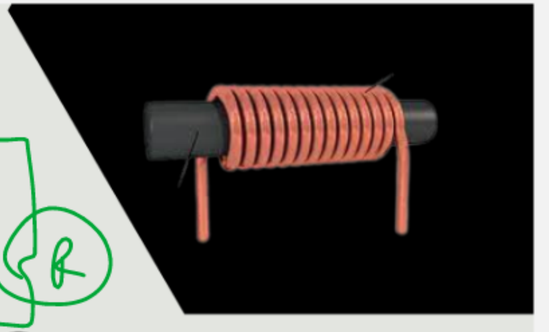


8 INDUCTOR'S POWER



9 WHEN CHARGED INDUCTOR BEHAVES AS A SOURCE , GURANTEED IT WILL CHANGE ITS OWN VOLTAGE POLARITY

PROPERTIES OF INDUCTOR



10 A FULLY CHARGED INDUCTOR BEHAVES AS A SHORT CIRCUIT IN DC CIRCUIT

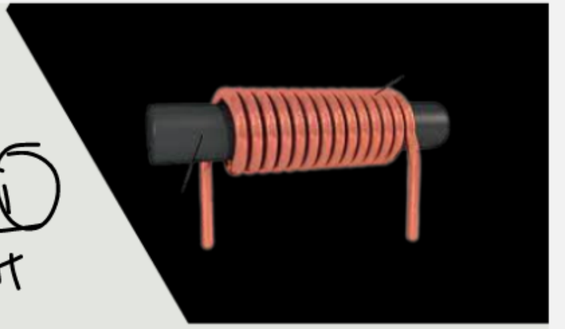
11 AN UNCHARGED INDUCTOR BEHAVES AS AN OPEN CIRCUIT in D.C. ckt.

12 IN DC CIRCUIT INDUCTORS ARE NOT RESPONSIBLE FOR REACTIVE POWER , THEY ARE RESPOSIBLE FOR REAL POWER

13 IN AC CIRCUIT INDUCTORS ARE RESPONSIBLE FOR REACTIVE POWER , THEY ARE NOT RESPOSIBLE FOR REAL POWER

PROPERTIES OF INDUCTOR

$V_L = L \frac{di}{dt}$



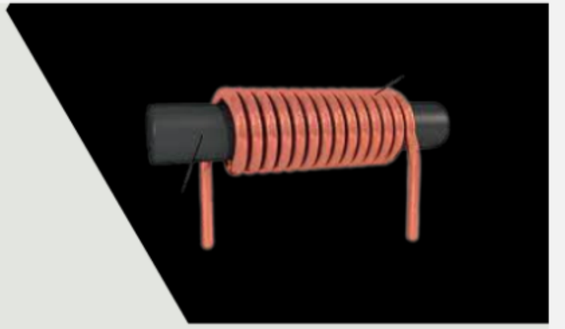
14 INDUCTOR CAN ALSO MAINTAIN ALMOST CONSTANT CURRENT FOR VARIABLE VOLTAGE .

15 INDUCTOR'S VOLTAGE MAY/MAYNOT BE ZERO FOR CONSTANT CURRENT .

16 IT IS GURANTEED THAT NDUCTOR WILL BEHAVE AS AN OPEN CIRCUIT AT

$t = \infty$ Always

PROPERTIES OF INDUCTOR

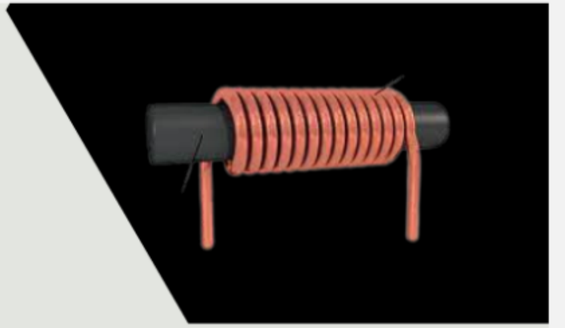


17 AN INDUCTOR MAY BE SHORT CIRCUIT OR OPEN CIRCUIT IN STEADY STATE IN DC CICUIT .

18 IN AC CIRCUIT INDUCTOR'S WILL NOT BE SHORT OR OPEN CIRCUIT .

19 TIME CONSTANT τ PALYS VERY IMPORTANT ROLE TO DEFINE TRANSIENT TIME

PROPERTIES OF INDUCTOR

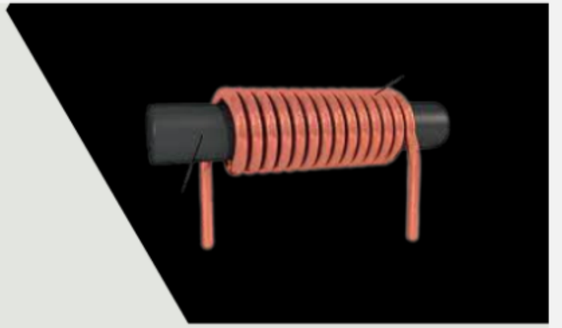


20 **A FULLY CHARGED INDUCTOR IN DC CIRCUIT , CAN BEHAVE AS A CONSTANT DC CURRENT SOURCE.**

21 **ENERGY STORED BY INDUCTOR**

$$\text{Energy stored} = \int_0^t P\,dt = \int_0^I Li'\,di' = \frac{1}{2}LI^2$$

PROPERTIES OF INDUCTOR



21 AN INDUCTOR CAN WORK AS SOURCE , BUT FOR A VERY VERY SAMLL TIME INTERVAL .

22 AN INDUCTOR CAN DEVELOP A VERY HIGH VOLTAGE (IN TERMS OF KV/MV) BUT FOR VERY SHORT TIME DURATION

23 if impulse Vol. applied across inductor, then inductor's current can change instantaneously.