SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

Accredited by NBA-AICTE and Accredited by NAAC – UGC with A+ Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 23EET203 – Electrical machines I

II YEAR / III SEMESTER

Unit 1 – DC Generator

Topic 2: Principle of operation of DC generator

What We'll Discuss

TOPIC OUTLINE

Case study

Faraday’s law

Lenz law

Fleming’s Right hand rule

Simple loop generator

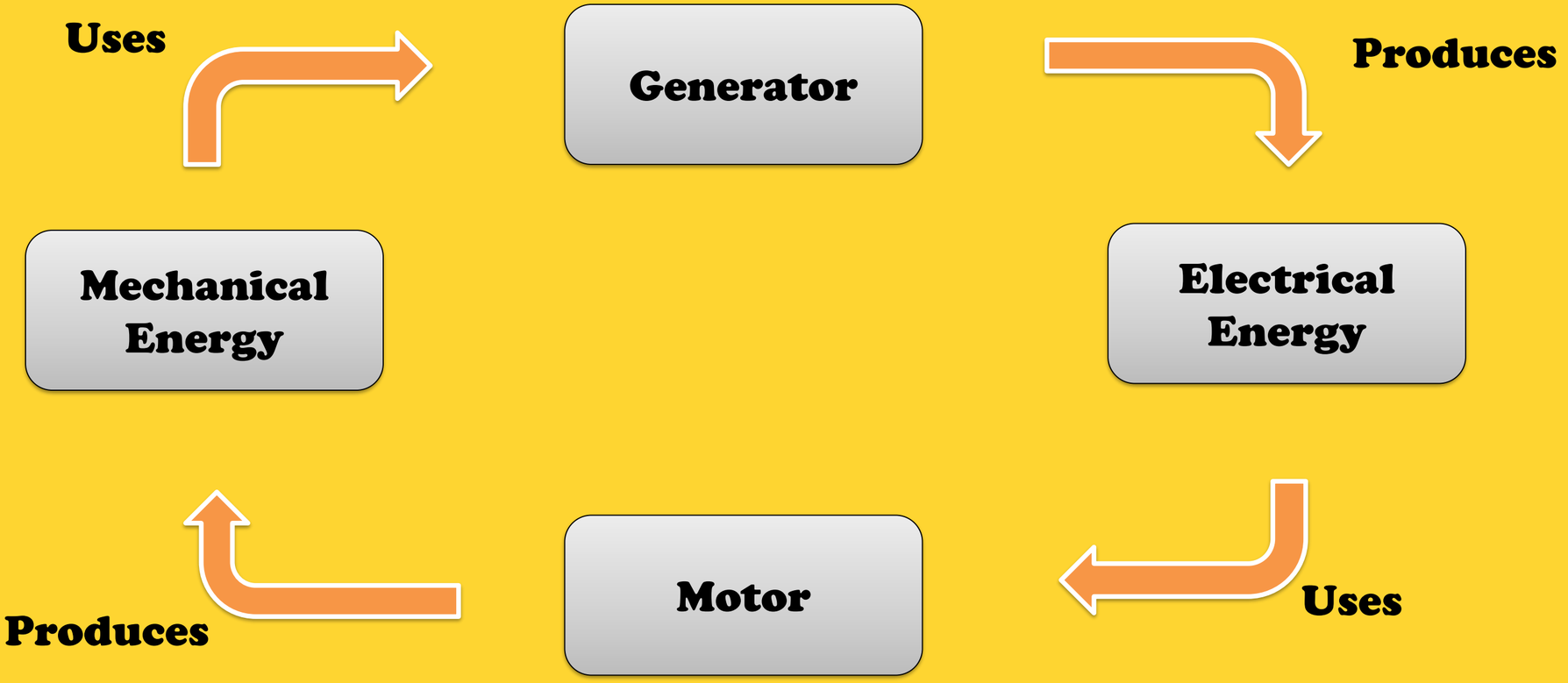
Principle of Operation

Assessment

CASE STUDY

- Sanjay was an 8 year old boy
- On a summer holiday went to his grandpa house
- He also went on a ride with his grandpa in a bicycle
- In the evening he was surprised to see
- In front of the cycle a bulb was glowing yellow in colour
- He enquired about it with his grandpa
- What would his grandpa replied?

Generator / Motor



Faraday's Law of Electromagnetic Induction

First Law :

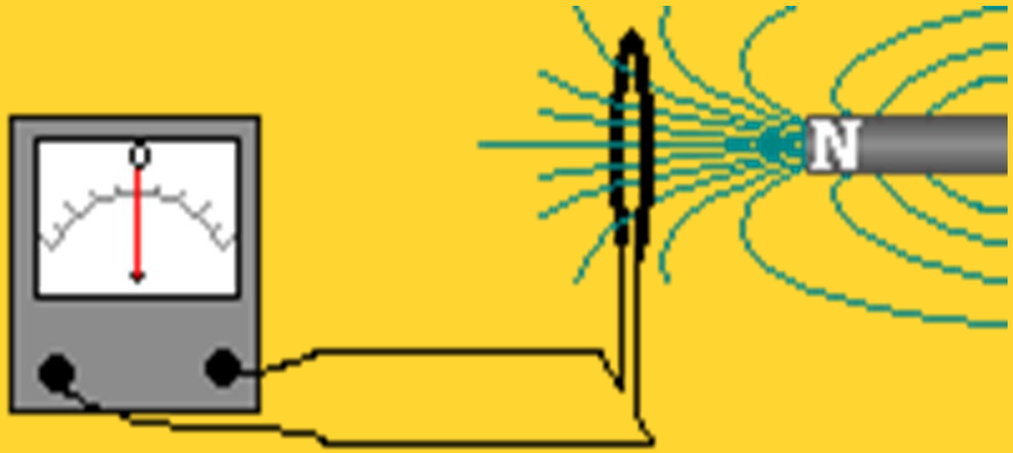
Whenever the magnetic flux linked with a circuit changes, an e.m.f. is always induced in it.

or

Whenever a conductor cuts magnetic flux, an e.m.f. is induced in that conductor.

Second Law :

The magnitude of the induced e.m.f. is equal to the rate of change of flux linkages.

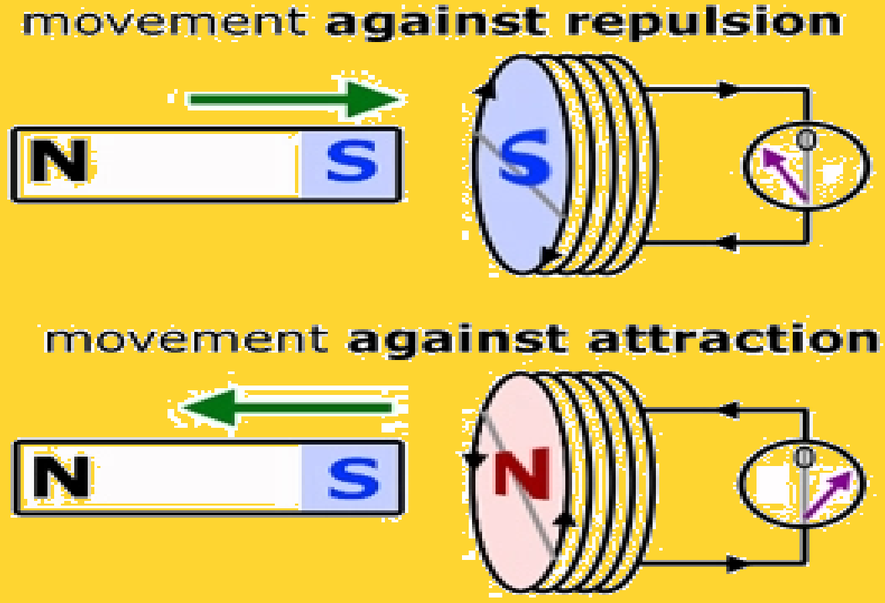


Lenz Law

"The induced currents in a conductor are in such a direction as to oppose the change in magnetic field that produces them.."

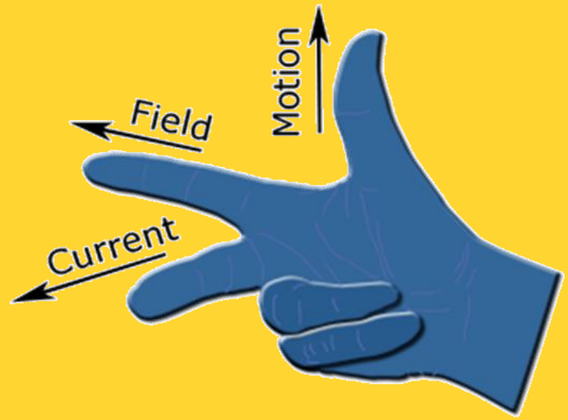
. or

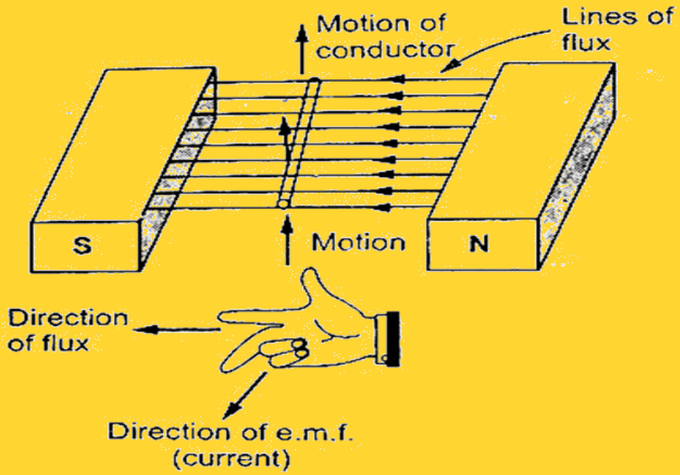
"The direction of induced E.M.F in a coil (conductor) is such that it opposes the cause of producing it.."



Fleming's Right Hand Rule

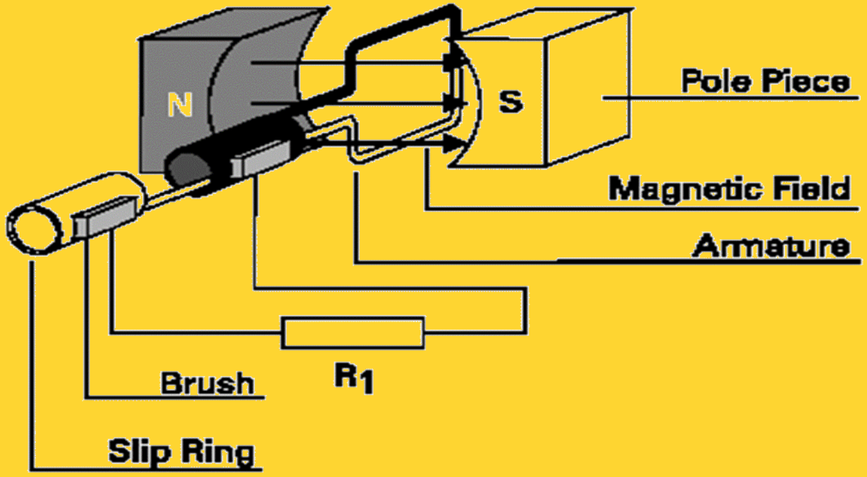
- The Thumb represents the direction of Motion of the conductor.
- The First finger (four finger) represents Field.
- The Second finger (Middle finger) represents Current





Basic requirements to be satisfied for generation of E.M.F

1. A uniform Magnetic field
2. A System of conductors
3. Relative motion between the magnetic field and conductors



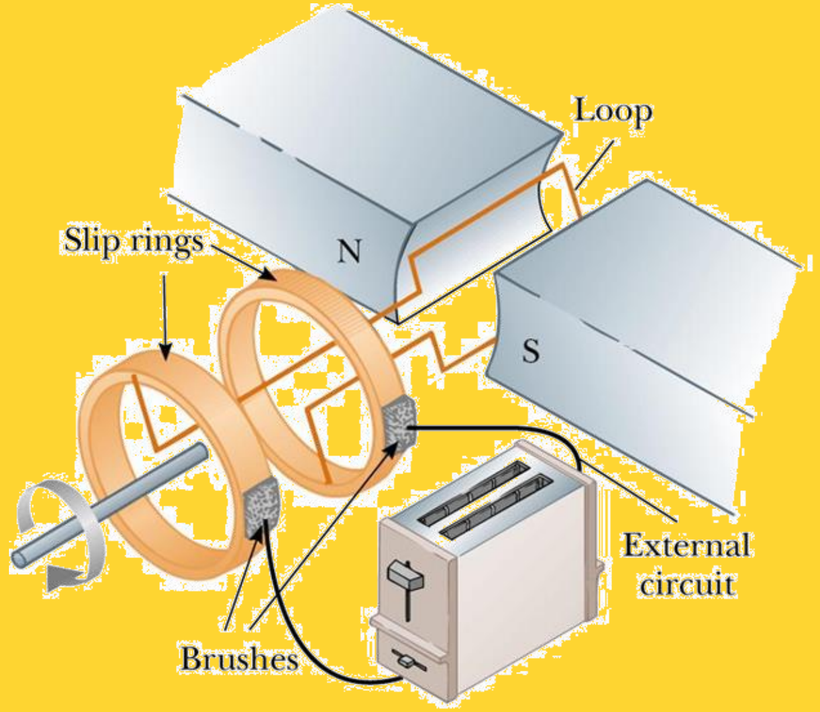
Magnetic field :- Permanent Magnet
(or)
Electro Magnet (practical)

Conductor :- Copper (or) Aluminum bars placed in slots cut around the periphery of cylindrical rotor

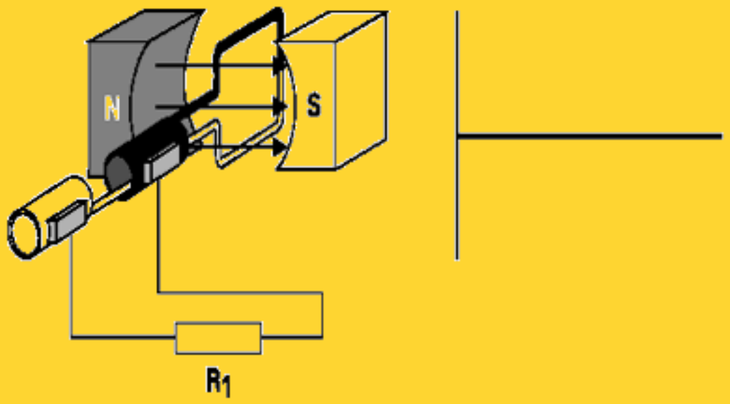
Relative motion:- By Prime Mover
Turbine
I.C Engine (Internal combustion)

PRINCIPLE OF OPERATION

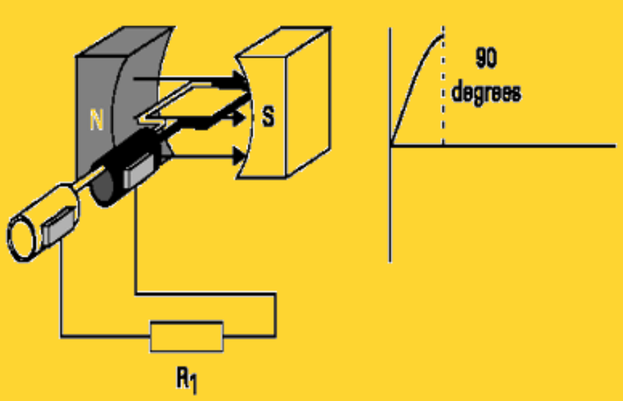
- DC generator converts mechanical energy into electrical energy.
- when a conductor move in a magnetic field in such a way conductors cuts across a magnetic flux of lines and e.m.f. produces in a generator and it is defined by faradays law of electromagnetic induction e.m.f. causes current to flow if the conductor circuit is closed.



Operation of a Generator



(A)



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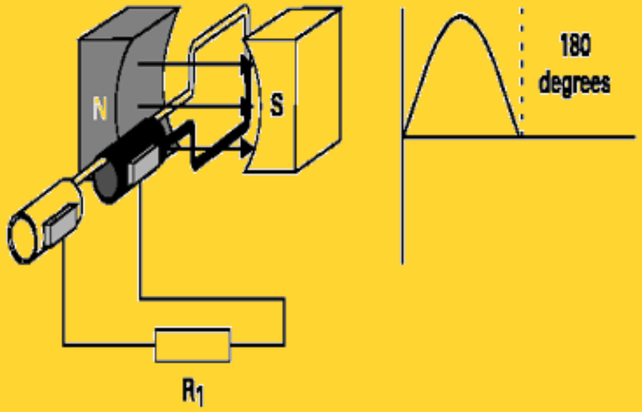

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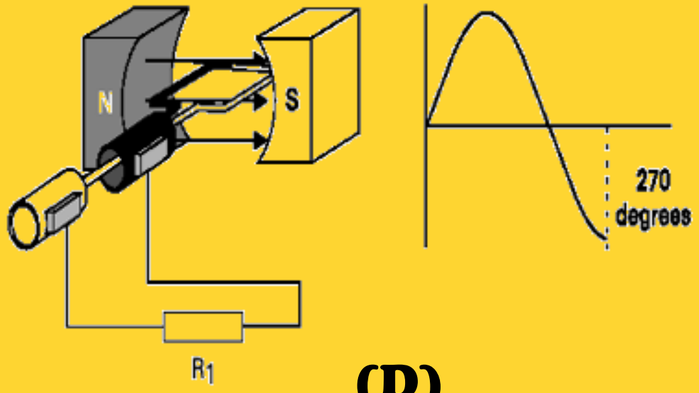

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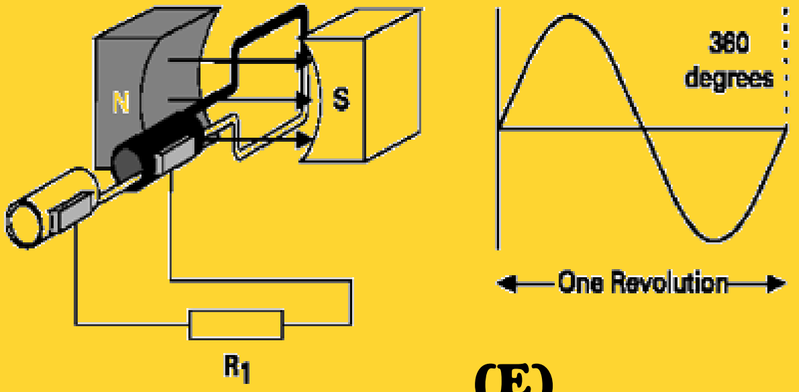
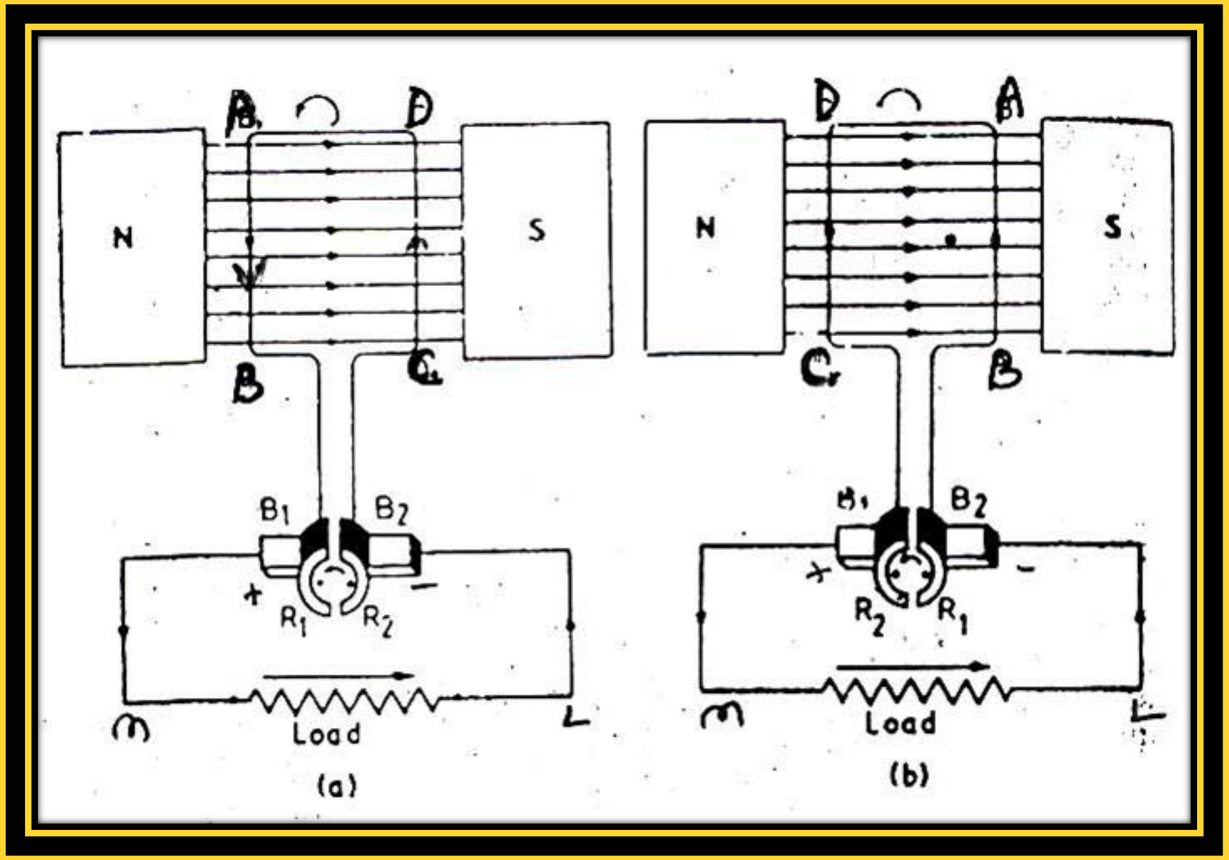


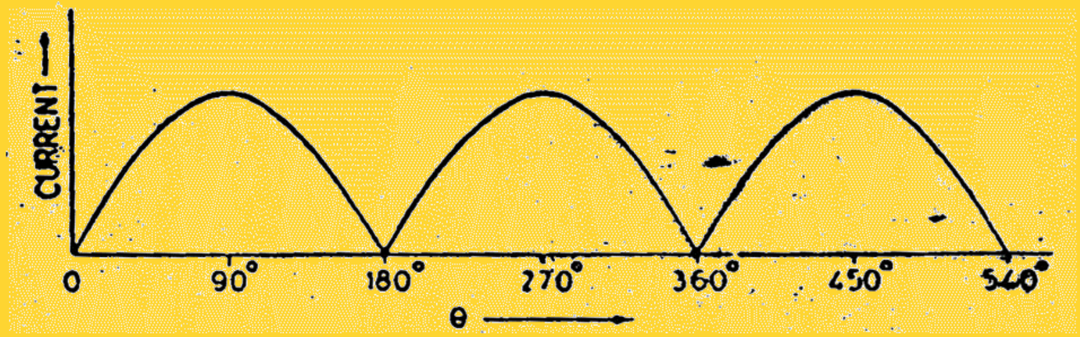
(E)

Operation of DC Generator – Split Rings



1st half cycle(0^0 to 180^0) Path of current $ABR_1B_1MLR_2B_2CD$

2st half cycle(180^0 to 360^0) Path of current $DCR_2B_1MLB_2R_1BA$



RECALL

1. Whenever the ---------- linked with a circuit changes, an e.m.f. is always induced in it.
2. The above law is called ---------- law
3. The direction of induced E.M.F in a coil is such that it ---------- the cause of producing it.
4. The above equation is stated by which law?

THANK YOU