# SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME : **23EEB201 THEORY OF DC MACHINES AND TRANSFORMERS**

II YEAR / 03 SEMESTER EEE

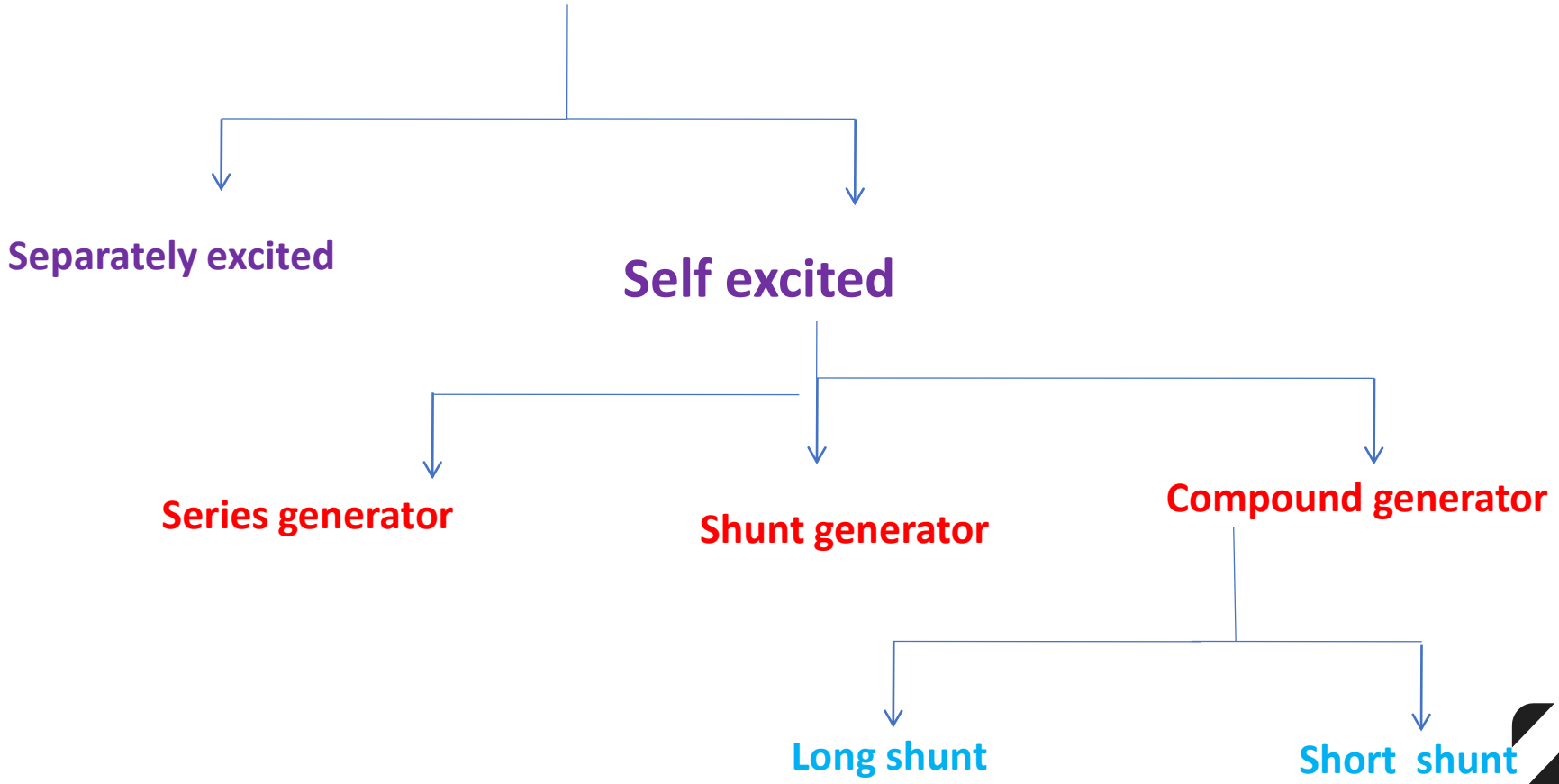
Unit 1 – DC GENERATOR

# Characteristics of DC Generator

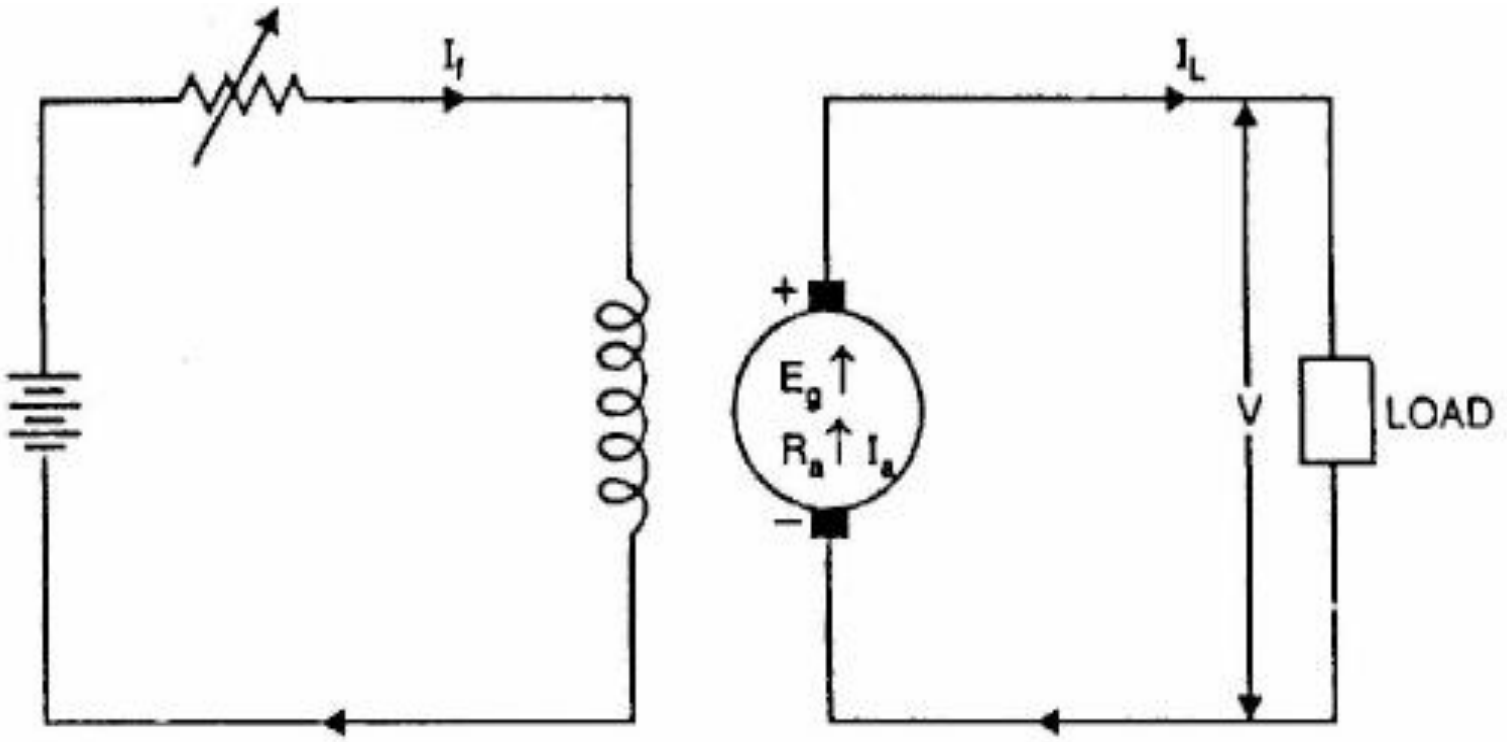
# Can You Answer?

- What is Characteristics?
- What is testing?
- Why we have to go for testing?
- What we understand from testing characteristics?

# Types of generators



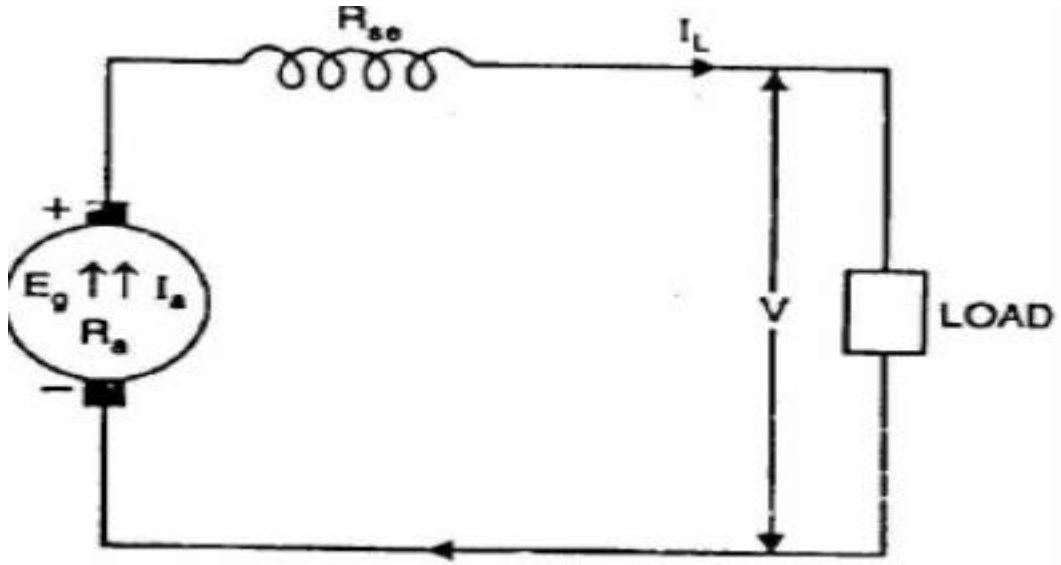
# Separately excited generator




Eg=V+Ia Ra

Ia=Il

# DC series generator




Armature current, $I_a = I_{se} = I_L = I$(say)

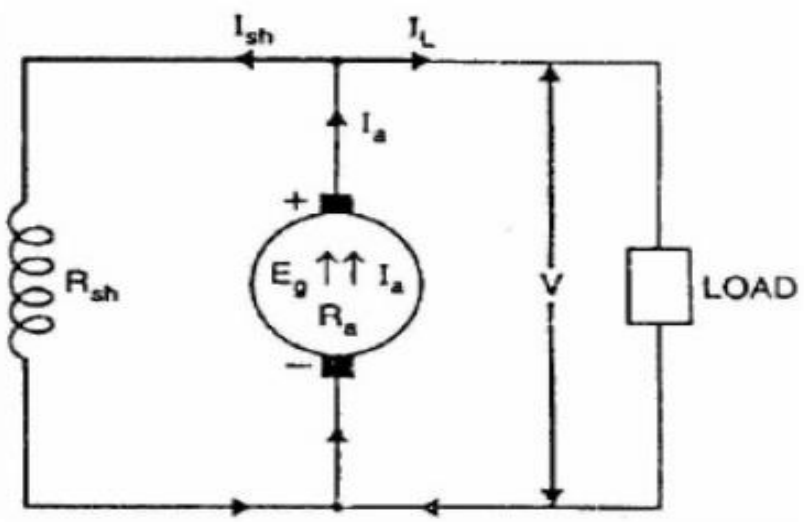
Terminal voltage, $V = E_G - I(R_a + R_{se})$

Power developed in armature = $E_g I_a$

Power delivered to load

$$= E_g I_a - I_a^2(R_a + R_{se}) = I_a[E_g - I_a R_a(- R_{se} = VI_a \text{ or } VI_L$$

# DC shunt Generator




Shunt field current, $I_{sh} = V/R_{sh}$

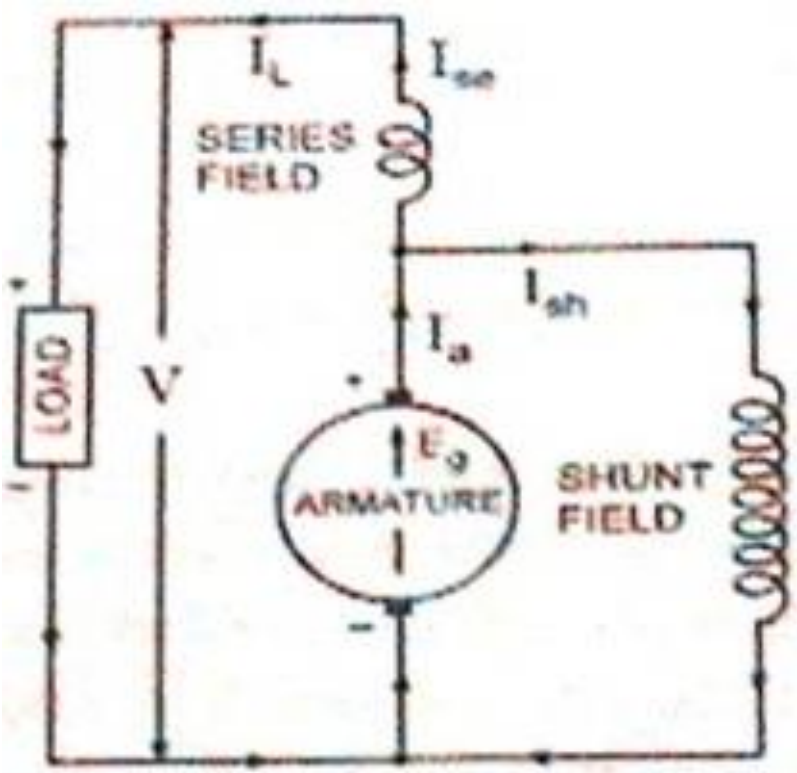
Armature current, $I_a = I_L + I_{sh}$

Terminal voltage, $V = E_g - I_aR_a$

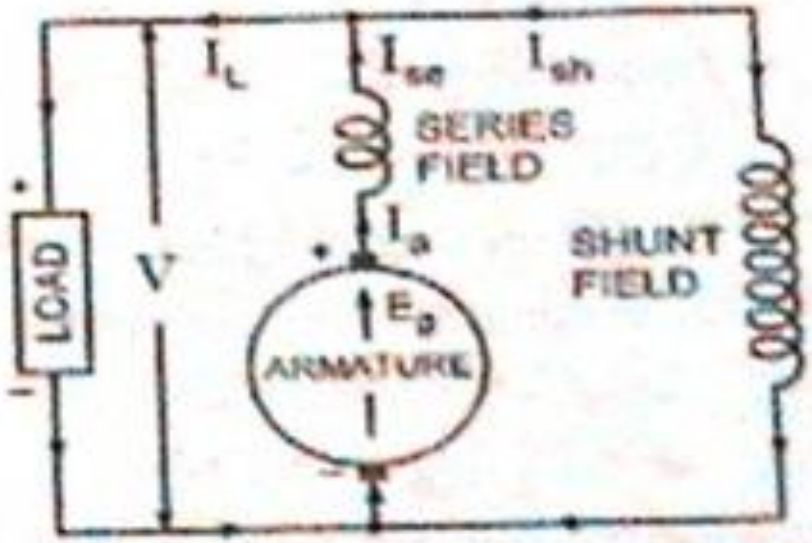
Power developed in armature = $E_gI_a$

Power delivered to load = $VI_L$

# DC Compound Generator

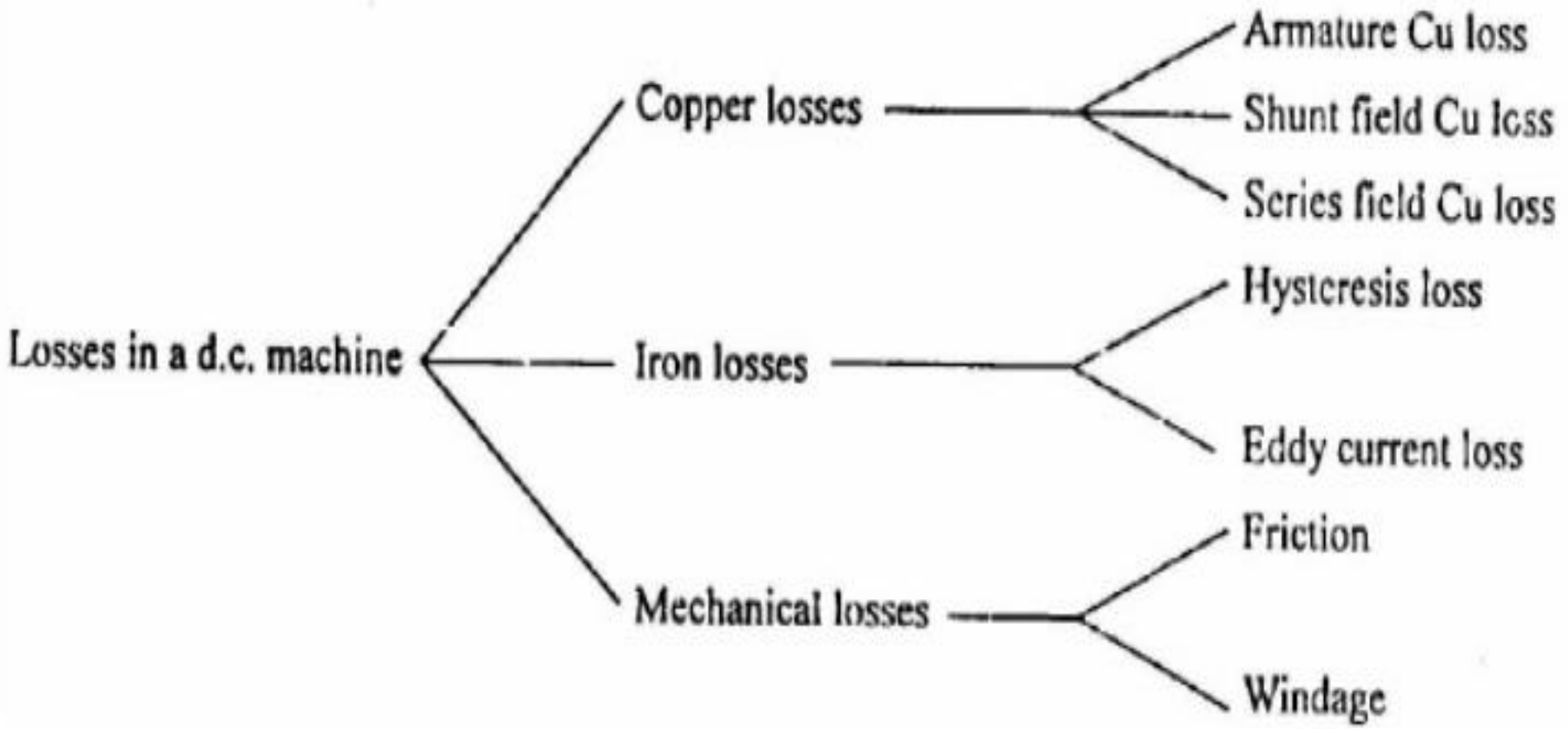



*(d) Short-Shunt Compound Wound Generator*




*(e) Long-Shunt Compound Wound Generator*

# Losses in a dc machine



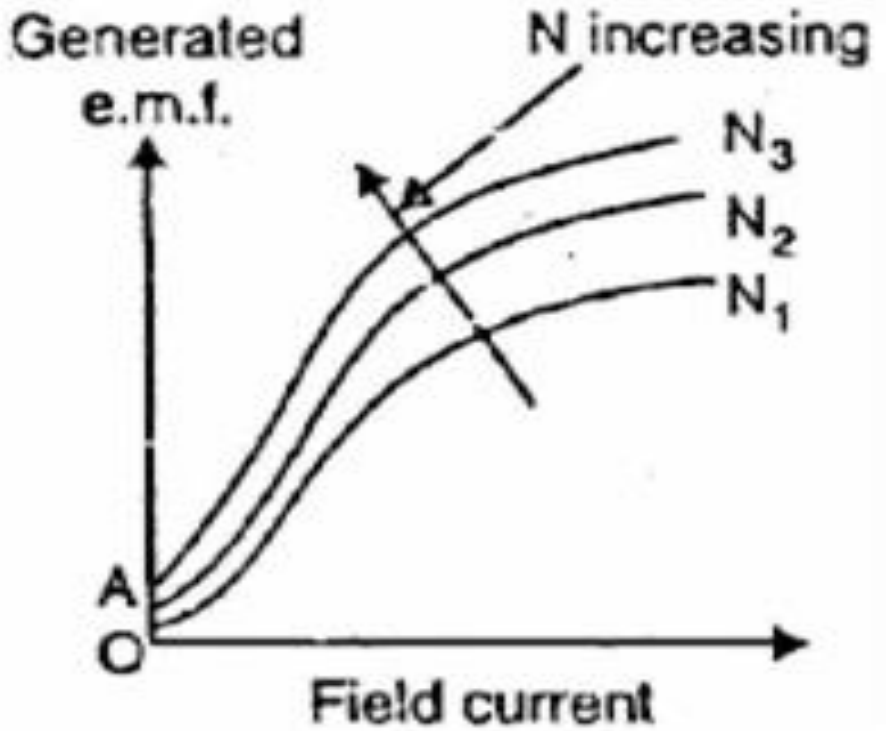
# Applications of DC generator

- DC shunt generator
  - To supply loads needing constant voltage
  - Battery charging
  - Exciters for ac generators
  - To supply loads needing constant voltage
- DC series generator
  - Used as boosters
  - Series incandescent lighting
- DC compound generators
  - To supply power to railway circuits
  - Elevator motors etc.

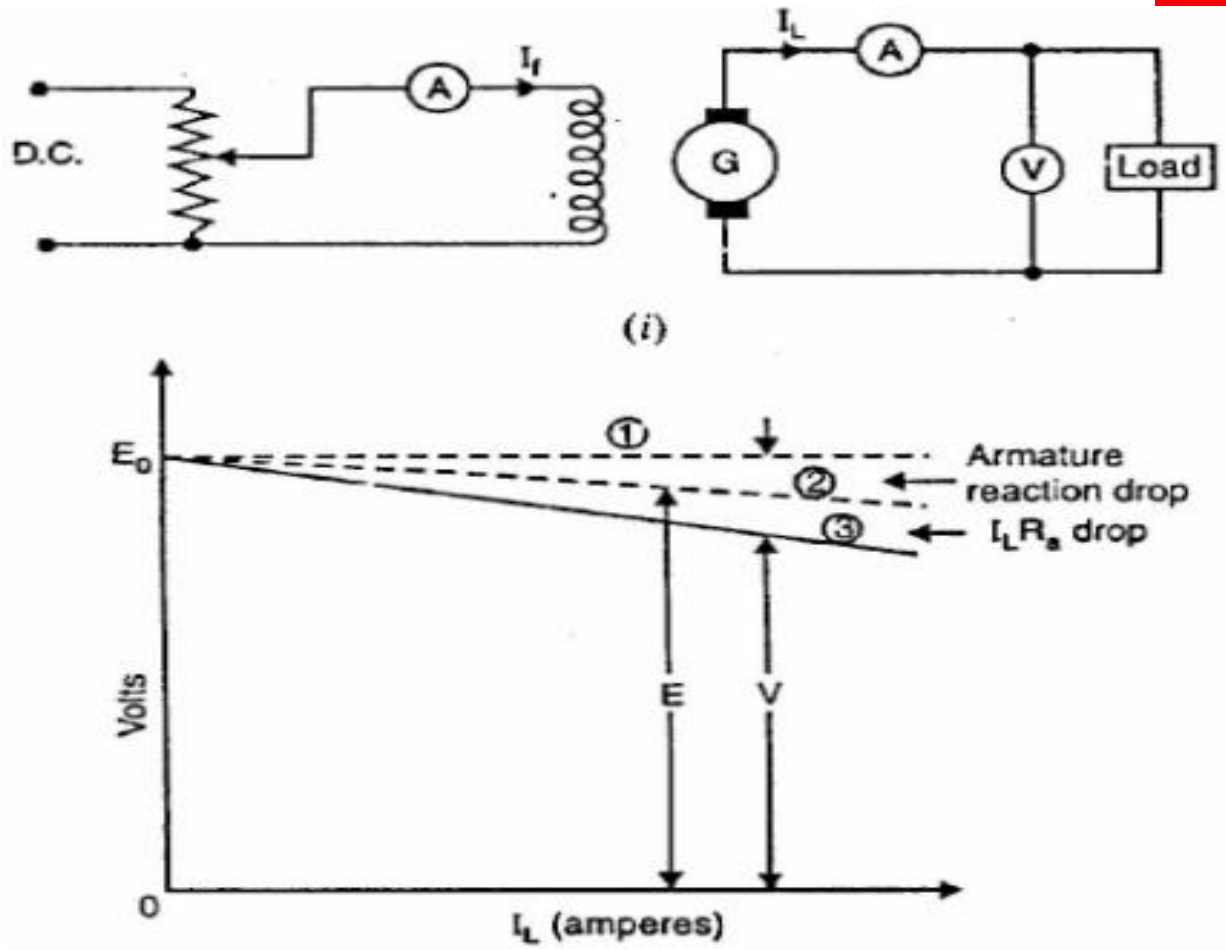
# Characteristics of DC generators

- Open circuit characteristics (OCC)(Eg/If)
- Internal characteristics(E/Ia)
- External characteristics(V/ $I_L$)

# Separately excited dc generator



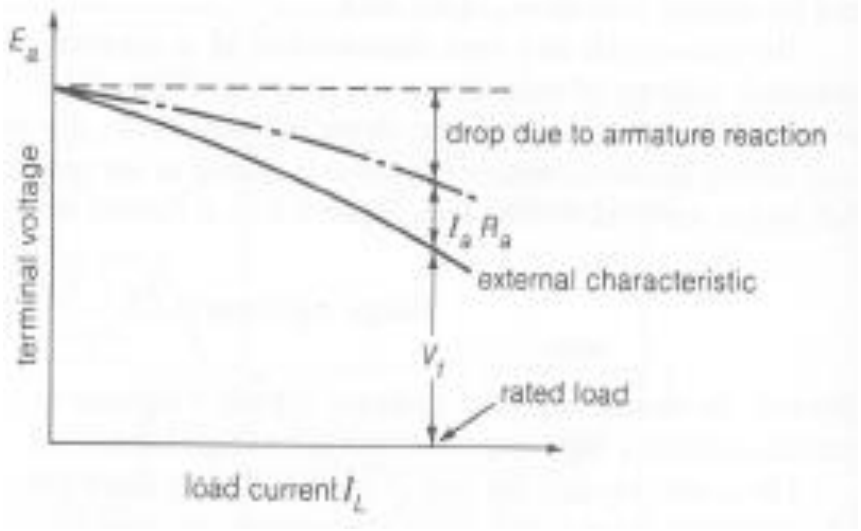

**OCC**




**Load characteristics**

# DC Generator Characteristics

It can be seen from the external characteristics that the terminal voltage falls slightly as the load current increases. *Voltage regulation* is defined as the percentage change in terminal voltage when full load is removed, so that from the external characteristics,




External characteristics

$$Voltage\,regulation = \frac{E_a - V_t}{V_t} \times 100$$

# ASSESSMENT

1. **The terminal voltage of a D.C. shunt generator drops on load because of all of the following reasons except**

(A) Armature reaction

(B) Armature resistance drop

(C) Field weakening due to armature reaction and armature

(D) Commutation

2. **Which of the following generating machine will offer constant voltage on all loads?**

(A) Self-excited generator

(B) Separately excited generator

(C) Level compounded generator

(D) All of the above

# REFERENCES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2. Gupta J.B,“ Theory and Performance of Electrical Machines”, S.K.Kataria and Sons, (2002)
3. Kothari D.P and Nagrath I.J“ Electric Machines”, Tata McGraw Hill Publishers, (2002)
4. Bhimbhra P.S., “Electrical Machinery”, Khanna Publishers, (2003)


**THANK YOU**