FACULTY OF ENGINEERING & TECHNOLOGY

Electrical Machine-1

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Shunt Wound DC Generators

In these type of DC generators, the field windings are connected in parallel with armature conductors, as shown in the figure below. In shunt wound generators the voltage in the field winding is same as the voltage across the terminal.

Here:

R_{sh} = Shunt winding resistance
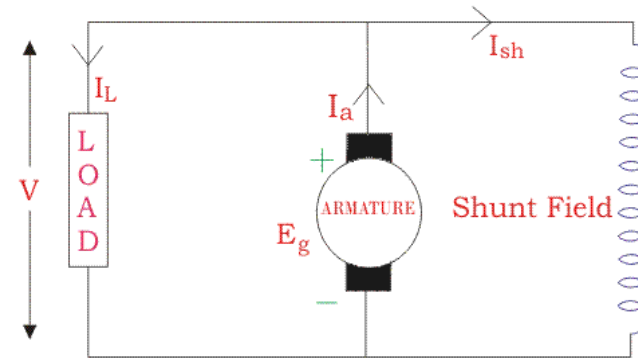
I_{sh} = Current flowing through the shunt field

R_a = Armature resistance

I_a = Armature current

I_L = Load current

V = Terminal voltage

E_g = Generated EMF

Shunt Wound Generator

Here armature current I_a is dividing in two parts – one is shunt field current I_{sh}, and another is load current I_L.

$$I_a = I_{sh} + I_L$$

Shunt field current is equal to,

$$I_{sh} = \frac{V}{R_{sh}}$$

Voltage across the load is equal to,

$$V = E_g - I_a R_a$$

Power generated is equal to,

$$P_g = E_g \times I_a$$

Power delivered to the load is equal to,

$$P_L = V \times I_L$$

Short Shunt Compound Wound DC Generator

Short Shunt Compound Wound DC Generators are generators where only the shunt field winding is in parallel with the armature winding, as shown in the figure below.

Series field current is equal to,

$$I_{sc} = I_L$$

Shunt field current is equal to,

$$I_{sh} = \frac{(V + I_{sc}R_{sc})}{R_{sh}}$$

Armature current is equal to,

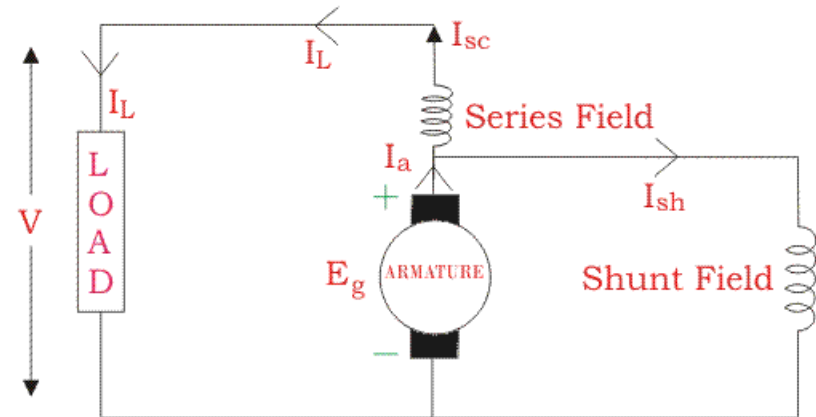$$I_a = I_{sh} + I_L$$

Voltage across the load is equal to,

$$V = E_g - I_aR_a - I_{sc}R_{sc}$$

Power generated is equal to,

$$P_g = E_g \times I_a$$

Power delivered to the load is equal to,

$$P_L = V \times I_L$$

Short Shunt Compound Wound Generator

Long Shunt Compound Wound DC Generator

Long Shunt Compound Wound DC Generator are generators where the shunt field winding is in parallel with both series field and armature winding, as shown in the figure below.

Shunt field current is equal to,

$$I_{sh} = \frac{V}{R_{sh}}$$

Armature current, I_a = series field current,

$$I_{sc} = I_L + I_{sh}$$
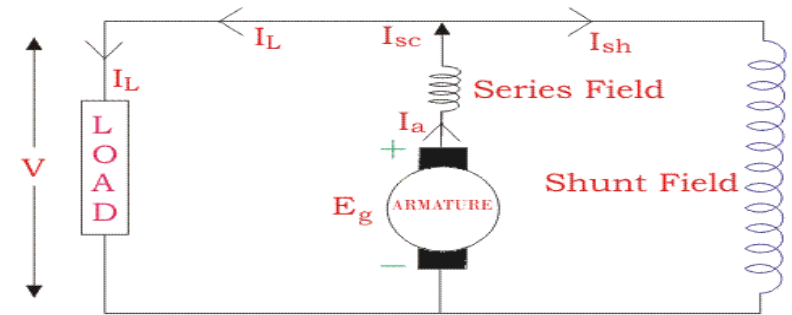
Voltage across the load is equal to,

$$V = E_g - I_a R_a - I_{sc} R_{sc} = E_g - I_a(R_a + R_{sc}) \left[\because I_a = I_{cs} \right]$$

Long Shunt Compound Wound Generator

Power generated is equal to,

$$P_g = E_g \times I_a$$

Power delivered to the load is equal to,

$$P_L = V \times I_L$$