

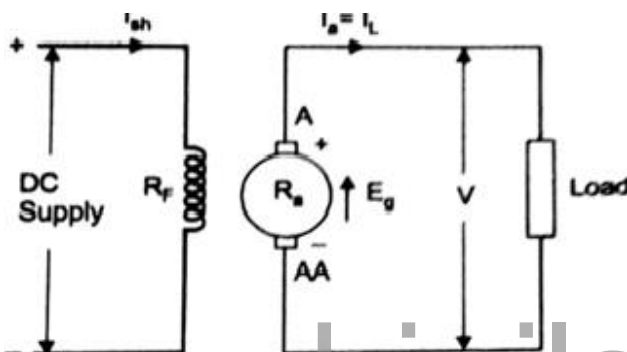
### 3.7 TYPES OF DC MOTOR:

1. Separately excited DC

motor 2. Self excited dc motor

- Series motor
- Shunt motor
- Compound motor
  1. Long shunt compound motor
  2. Short shunt compound motor

### SEPARATELY EXCITED DC MOTOR:

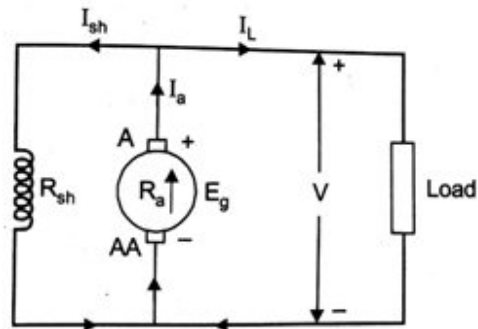


- Field winding and armature are separated.
- Field winding is excited by a separate DC source-separately excited dc motor.
- $I_a = I_L$
- $E_b = V - I_a R_a - V_{brush}$

### DC SERIES MOTOR:

- Field winding is connected in series with armature.
- Less number of turns.
- $R_{se}$  –resistance of series field winding-small.
- $I_L$ =line current
- $I_a$ =series field
- $V = E_b + I_a R_a + I_{sc} R_{sc} + V_{brush}$ .
- $V = E_b + (R_a + R_{se}) I_a$ .
- $\Phi \propto I_{se} \propto I_a$

### DC SHUNT MOTOR:



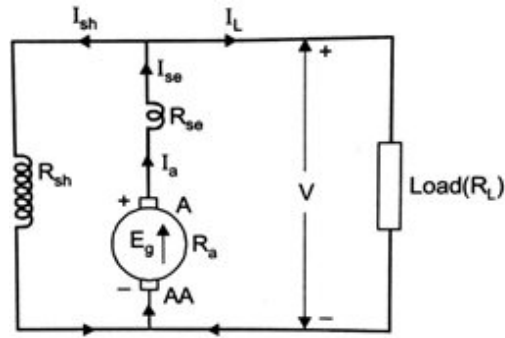
- Field winding is connected across the armature.
- More number of turns with less cross sectional area.
- $R_{sh}$  is the shunt field winding
- $R_a$  is the armature resistance.
- $R_a$  is small,  $R_{sh}$  is large.
- Voltage  $v$  = voltage across the armature and field winding.
- $I_L$  is the line current, divided into two paths
  1. Field winding
  2. Armature winding
- $I_L = I_a + I_{sh}$
- $I_a$  = armature current
- $I_{sh}$  = shunt field current
- $I_{sh} = V / R_{sh}$
- $V = E_b + I_a R_a + V_{brush}$
- $\Phi \propto I_{sh}$
- Input is constant, so flux is constant.
- Also known as constant flux motor.

### DC COMPOUND MOTOR:

#### 1. LONG SHUNT:

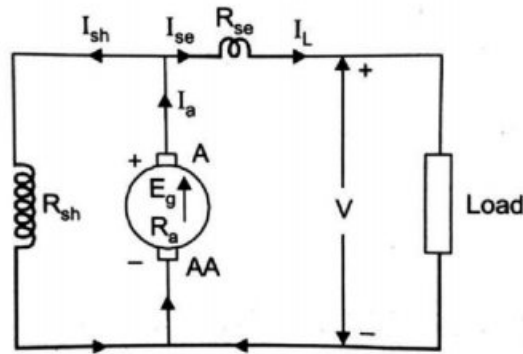
- Shunt field winding is connected to both the armature and the field winding.
- $I_L = I_{sc} + I_{sh}$
- $I_{se} = I_a$
- $I_L = I_a + I_{sh}$
- $I_{sh} = V / R_{sh}$

- Voltage equation  $V = E_b + I_a(R_a + R_{se}) + V_{brush}$



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## 2. SHORT SHUNT:



- Shunt field winding is connected across armature and series field winding is connected in series.
- $I_L = I_{se}$
- $I_L = I_a + I_{sh}$
- $I_L = I_{se} = I_a + I_{sh}$
- Voltage drop =  $V - I_L R_{se}$
- $V = E_b + I_a R_a + V_{brush}$
- $I_{sh} = \frac{V - I_L R_{se}}{R_{sh}}$