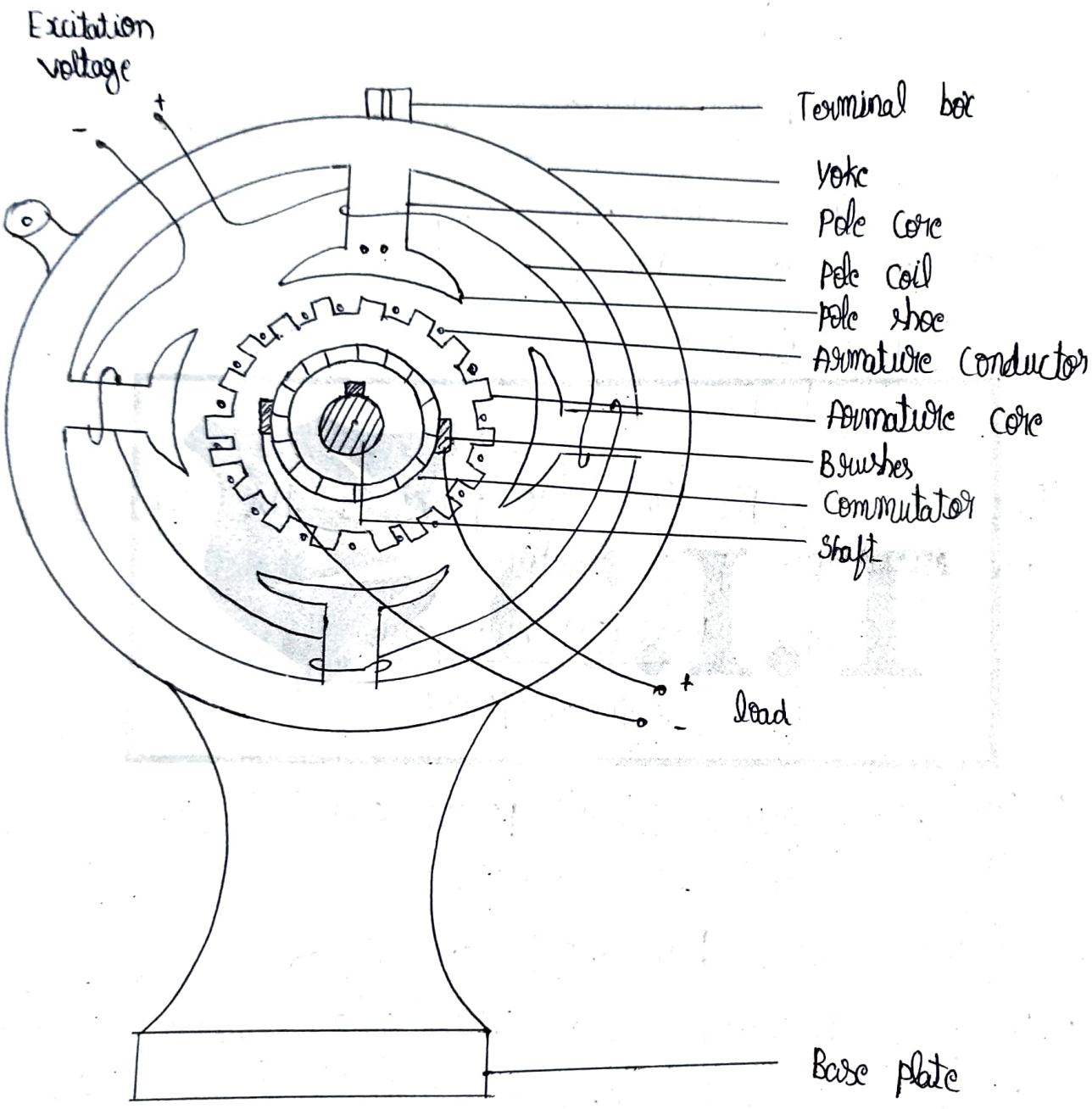
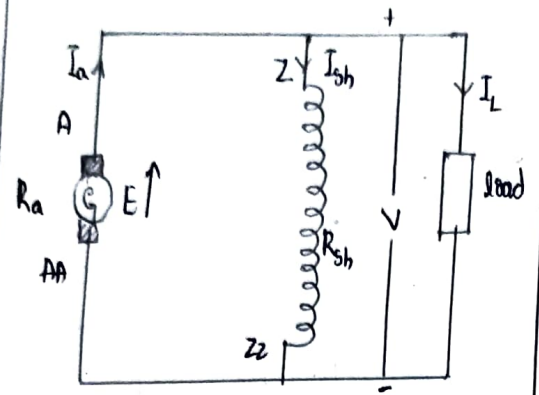
Assignment -02

1 Construction of DC generator with a neat labelled diagram.



2 Mention the different types of DC generator

DC Shunt Generator

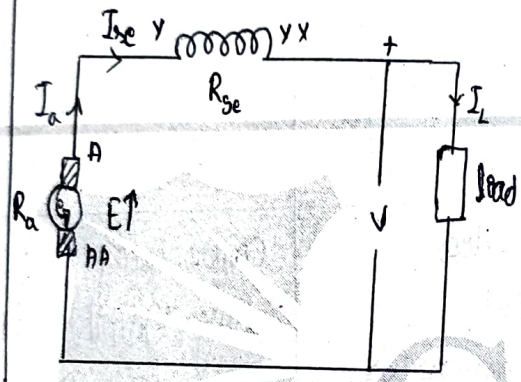


$I_a = I_{sh} + I_L$

$V = E - I_a R_a - BCD$

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

DC Series Generator

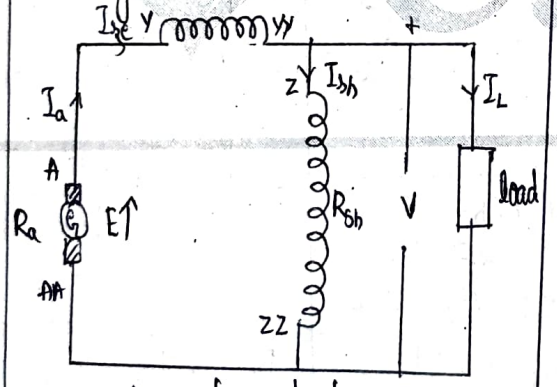


$I_a = I_{se} = I_L$

$V = E - I_a (R_a + R_{se}) - BCD$

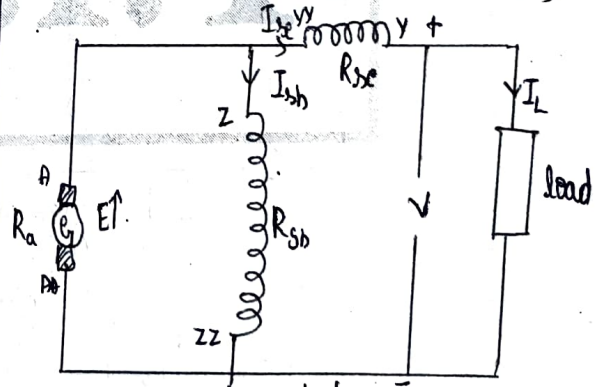
DC Compound Generator

a. Long Shunt (Cummulative)



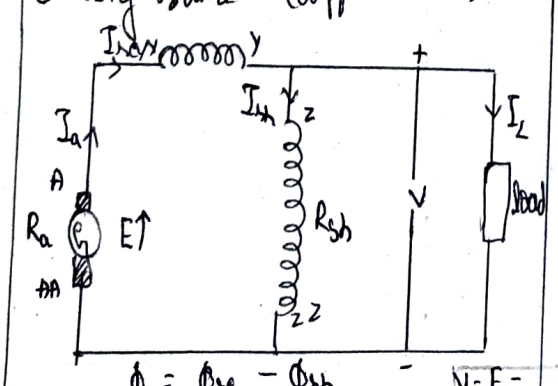
$\phi = \phi_{se} + \phi_{sh}$

b. Short Shunt (cummulative)



$\phi = \phi_{se} + \phi_{sh}$

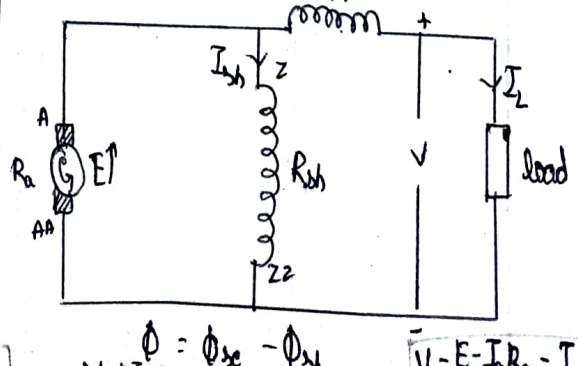
c. long shunt (differential)



$\phi = \phi_{se} - \phi_{sh}$

$I_{sh} = V / R_{sh}$ $I_a = I_{sh} + I_L$ $V = E - I_a(R_a + R_{se})$ and $I_{sh} = \frac{V + I_L R_{se}}{R_{sh}}$

d. Short shunt (differential)



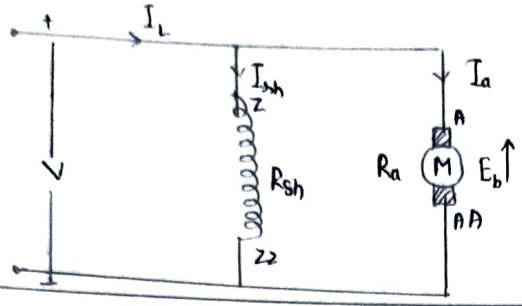
$\phi = \phi_{se} - \phi_{sh}$

$I_a = I_L + I_{sh}$

$V = E - I_a R_a - I_L R_{se} - BCD$

3 Mention the different types of DC motor

DC shunt motor

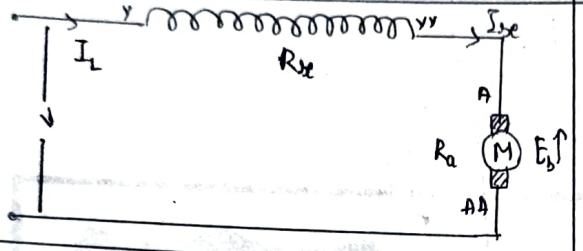


$I_a = I_L - I_{sh}$

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

$E_b = V - I_a R_a$ - BCD - ARD

DC Series motor

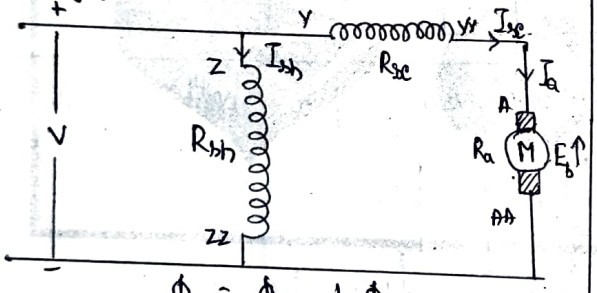


$I_L = I_{se} = I_a$

$E_b = V - I_a (R_a + R_{se})$ - BCD - ARD

DC compound motor

Commutatively Compounded long Shunt DC motor

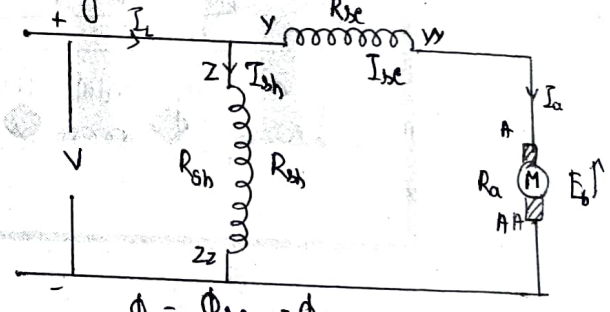


$\phi = \phi_{se} + \phi_{sh}$

$I_{sh} = V/R_{sh}$, $I_a = I_L - I_{sh}$

$E_b = V - I_a (R_a + R_{se})$ - BCD - ARD

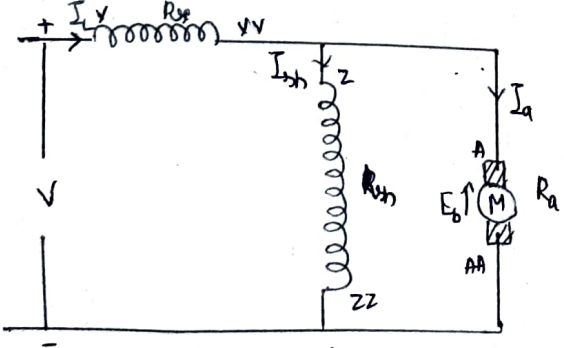
Differentially Compounded long Shunt DC motor



$\phi = \phi_{se} - \phi_{sh}$

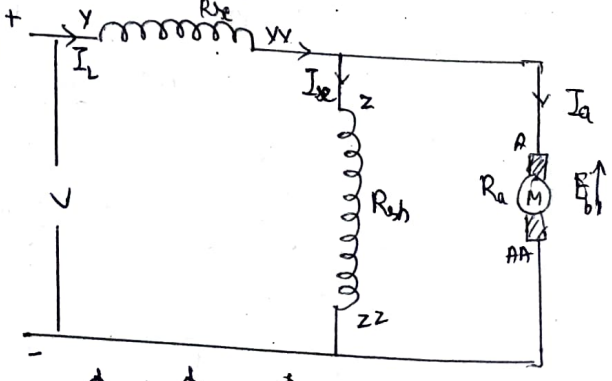
$E_b = V - I_a (R_a + R_{se})$ - BCD - ARD

Commutatively Compounded Short Shunt DC motor



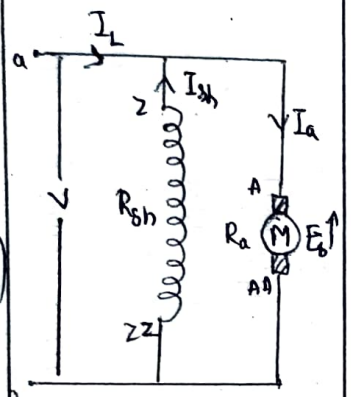
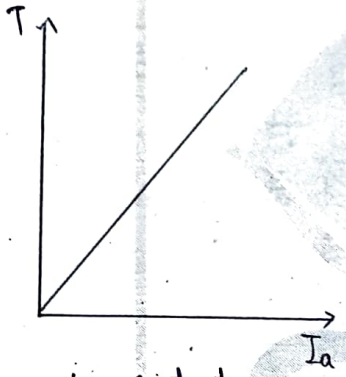
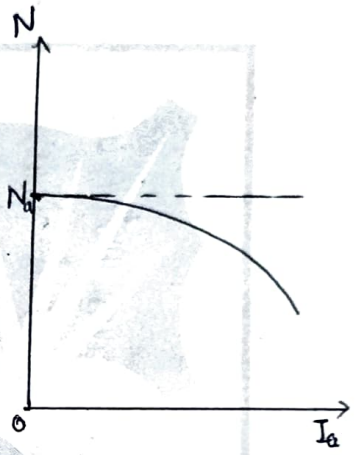
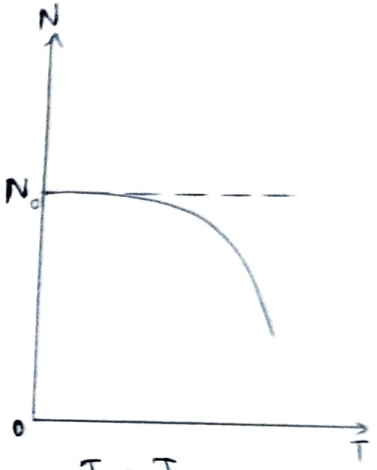
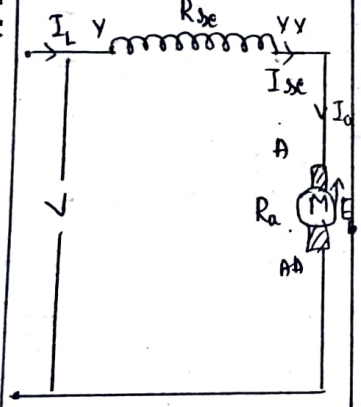
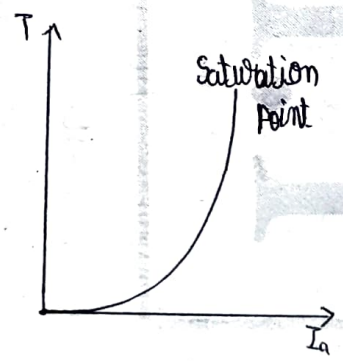
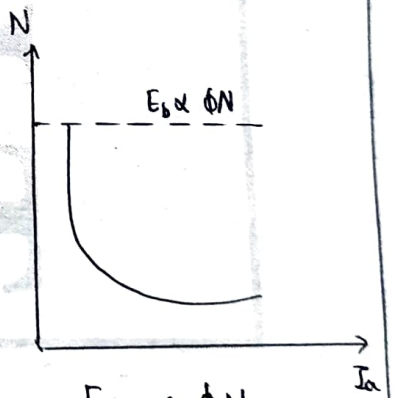
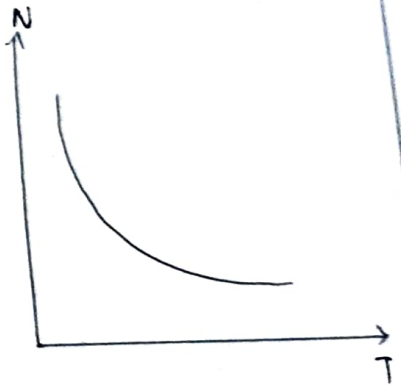
$\phi = \phi_{se} + \phi_{sh}$

Differentially Compounded Short Shunt DC motor



$\phi = \phi_{se} - \phi_{sh}$

Characteristics of DC motors :-

Types	Figure	Torque V/s armature current	Speed V/s armature current	Speed V/s Torque
DC Shunt Motor :- $E_b = \frac{\phi ZNP}{60A}$ $T = 0.159 \phi Z I_a \left(\frac{P}{A}\right)$ N → Constant * Starting speed is low		 ϕ = constant $T \propto I_a$	 $E \propto N \quad V - I_a R_a$	 $T \propto I_a$ $N \propto V - I_a R_a$
DC Series Motor: $E_b = \frac{\phi ZNP}{60A}$ * Variable speed * Starting speed is high * Should not start without load		 $T \propto I_a$ $T \propto I_a^2$ $E_b = V - I_a(R_a + R_{se})$	 $E_b \propto \phi N$	 $I_a \propto T$
	$T \propto \phi I_a$ $\phi \propto I_a$ $T \propto I_a^2$			

5 Write the Applications of DC motors

→ (i) DC Shunt Motor

From the characteristics of DC shunt motor we realised that it has medium starting torque and its speed remains almost constant from no load to full load.

Hence it is used where constant speed is required and the starting torque required is not very high such as for lathes, Centrifugal pumps, fans, reciprocating pumps, drilling machines, Boring machines, shipping and weaving machines etc...

(ii) DC series motor

From the characteristics of DC series motor we realize that it has very high starting torque and its speed varies widely from no load to full load. Hence it is used where very high starting torque variable speed is required such as for electric traction work. Electric locomotives, Trolleys, Cranes, Hoists, Conveyers, Air Compressor, Vacuum cleaners, hair driers & Sewing machines etc..

(iii) DC Compound motor

The characteristics of cumulatively compounded DC motor lies between the DC shunt motor and DC series motor. It has high starting force and variable speed. It is used where loads are suddenly applied or removed such as shears, punches, Coal cutting machines, elevators, conveyors, heavy planners, rolling mills, Ice machines, printing press, Air Compressors etc.. The differentially compounded DC motor has no partical applications because of its undesirable characteristics.