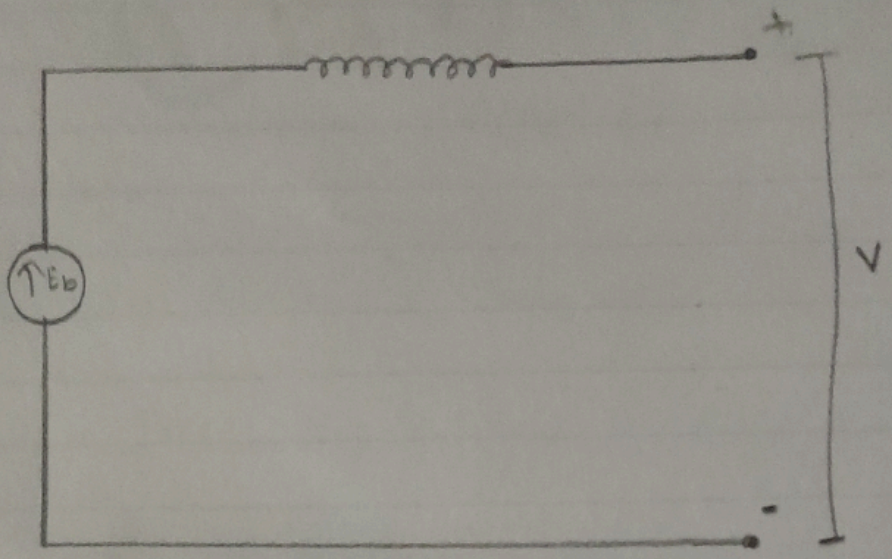

fig. [DC series motor]

Observation

Torque T_1	T_2	RPM (N)	Current (A)	Torque
0	0	1500	0.70	0
1	0.8	680	1.5	0.2
1.2	0.75	608	1.7	0.45
2	1	471	2.1	1
2.5	1.2	408	2.3	1.3
3.5	1	328	2.2	2.75
3.75	1.25	310	2.8	2.5

Torque = $T_1 - T_2$

N (RPM) is speed of motor

Date

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Practical - 1

Aim - To Study the characteristics of DC Series motor.

Equipment required - DC Series motor, Tachometer, Load belt, and Power Supply.

Theory - Dc motor is a type of dc machines which Convert electrical energy into mechanical energy. The operation of motor mainly depends on the electromagnetic Principle.

Whenever magnetic field is founded approximately a Current Carrying Conductor Cooperate with a external magnetic fulod and then resulting motion Can be generated.

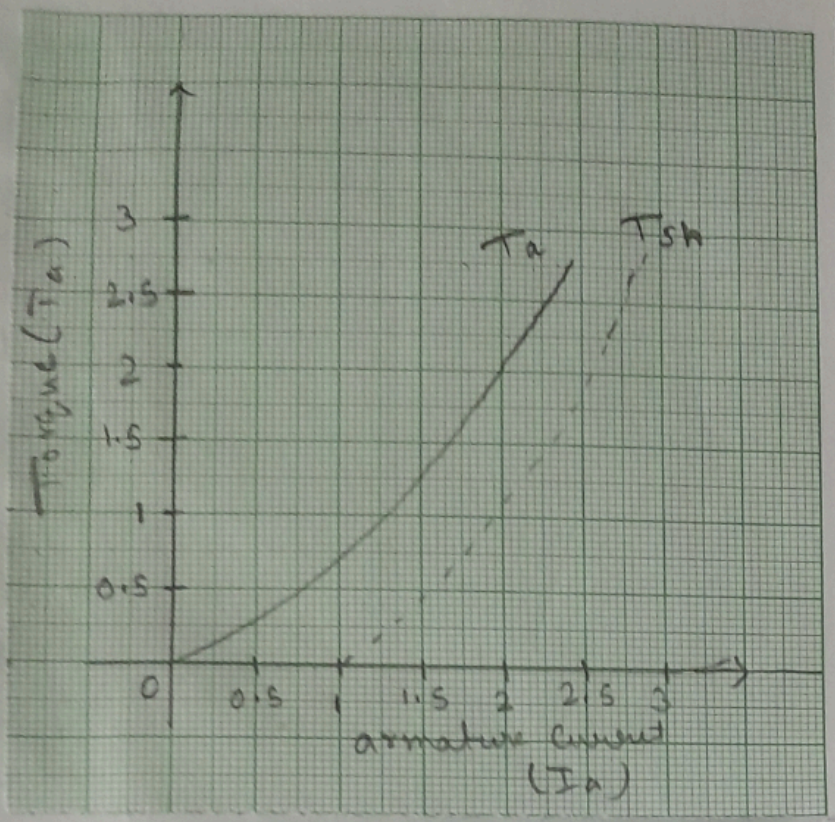
on Series motor, field windings are in Series with the rotating armature

EMF Equation

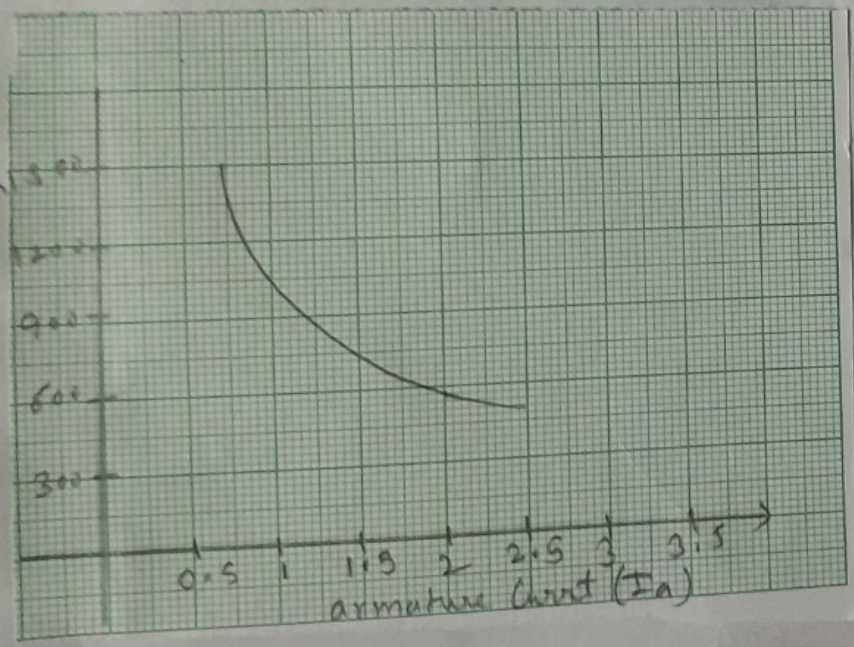
$$E_b = \frac{P\Phi ZN}{60A}$$

here, $N \propto \frac{E_b}{\Phi}$ and $T \propto \phi \times I_a$

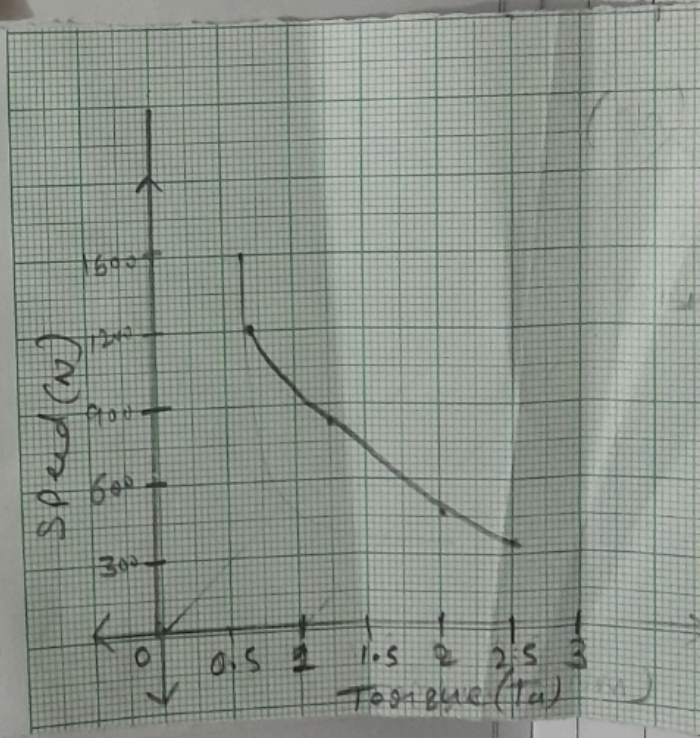
Teacher's Signature :



Torque vs Armature Current
(Ta vs Ia)



(N vs Ia)



(N vs Ta)

Date

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Torque is directly proportional to Current Speed inversely proportional to Current & Speed should be inversely proportional to i/p Current.

Result

Graph of Ta v/s Ia, N v/s Ia and N vs Ta is successfully drawn.

Precautions

- There should be ~~land~~ load while starting DC series motor
- Speed should not exceed max. limit.

Observation table

Torque	Current	Speed
1.2	4.5	0
1.4	4.4	300
1.7	4.3	600
2.1	4.2	900
2.8	4.1	1200
3.8	3.9	1500
3.6	2	1650
3.3	3.7	1350
0	0.2	1800

Practical - 2

Aim
To Study Characteristics of DC Series Single phase Induction motor.

Equipment Required
Single phase Induction motor, Auto transformer, Techometer Ammeter.

Theory
Single phase induction motor are not Self-Starting motor. One method of them of Self-Starting is by providing windings on the. The ~~motor~~ rotor has proper three phase windings with three loads brought out ~~same~~ through Slip wings and brushes. These loads are normally short circulated when the motor is running.

Resistance are introduced in a motor circuit via that Slip wings at the time of Starti to improve the Starting torque.

Synchronous speed N_s is given by

$$N_s = \frac{120f}{P}$$

$P \rightarrow$ no. of Pole

Teacher's Signature :

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Result

The characteristics of single phase induction motor is successfully done.

Precautions

- Before switching on the supply the variac is kept in minimum position
- Initially there should be no load while starting the motor.

Teacher's Signature : _____

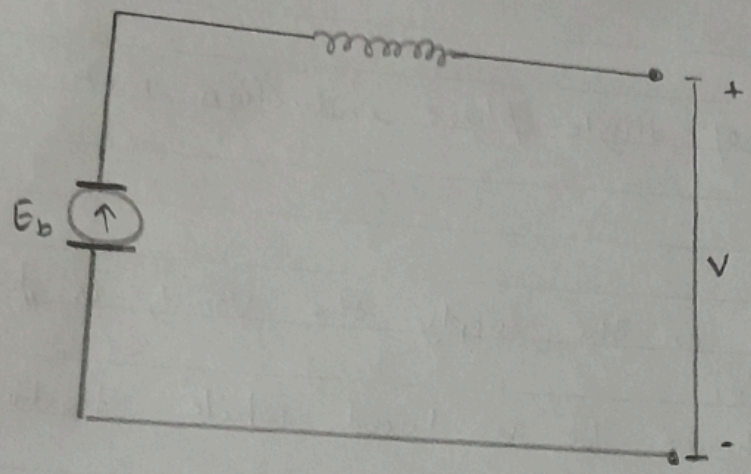

fig. (DC shunt motor)

Observation

Torque T_1	Torque 2	RPM (N)	Current (A)	Torque
0	0	1500	0.70	0
1	0.8	620	1.5	0.2
1.2	0.75	608	1.7	0.45
2	1	471	2.1	1
2.5	1.2	408	2.3	1.3
3.5	1	328	2.7	2.75
3.75	1.25	310	2.8	2.5

Date

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Practical - 3

Aim

To study the characteristics of a DC Shunt motor.

Equipment Required

DC Shunt motor, Techometer, Load belt & Power Supply.

Theory

It is a type of dc motor which convert electrical energy into mechanical energy.

Whenever DC motor is turned on, then DC flows throughout the Stator as well as the motor. This Current flows will generate two fields namely the pole as well as the armature.

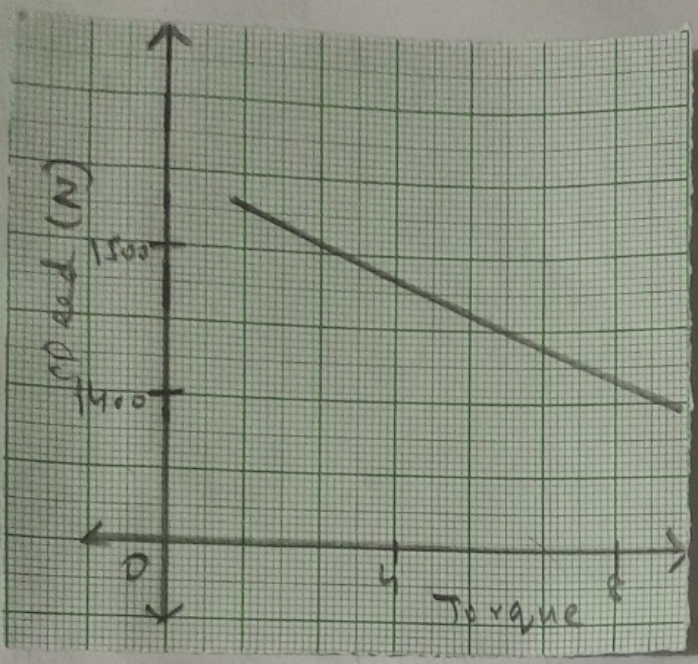
The Current supply will divided into two ways like I_a and I_{sh}. where I_a will supply throughout the 'Ra' resistance armature winding. In the same ways 'I_{sh}' will supply through the 'R_{sh}' resistance field winding

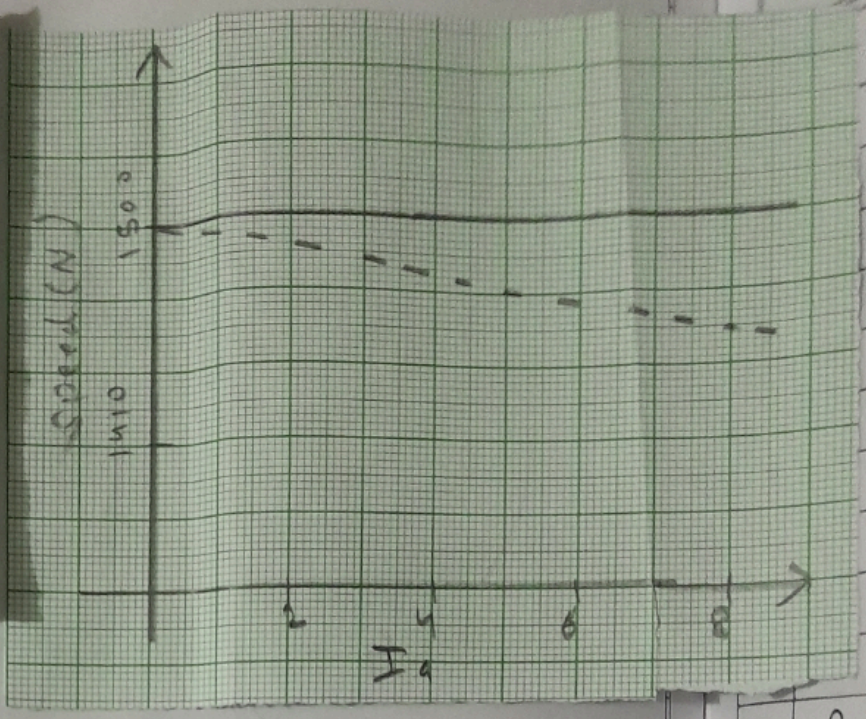
$$I_t = I_a + I_{sh} \qquad \text{where } I_{sh} = \frac{E}{R_{sh}}$$

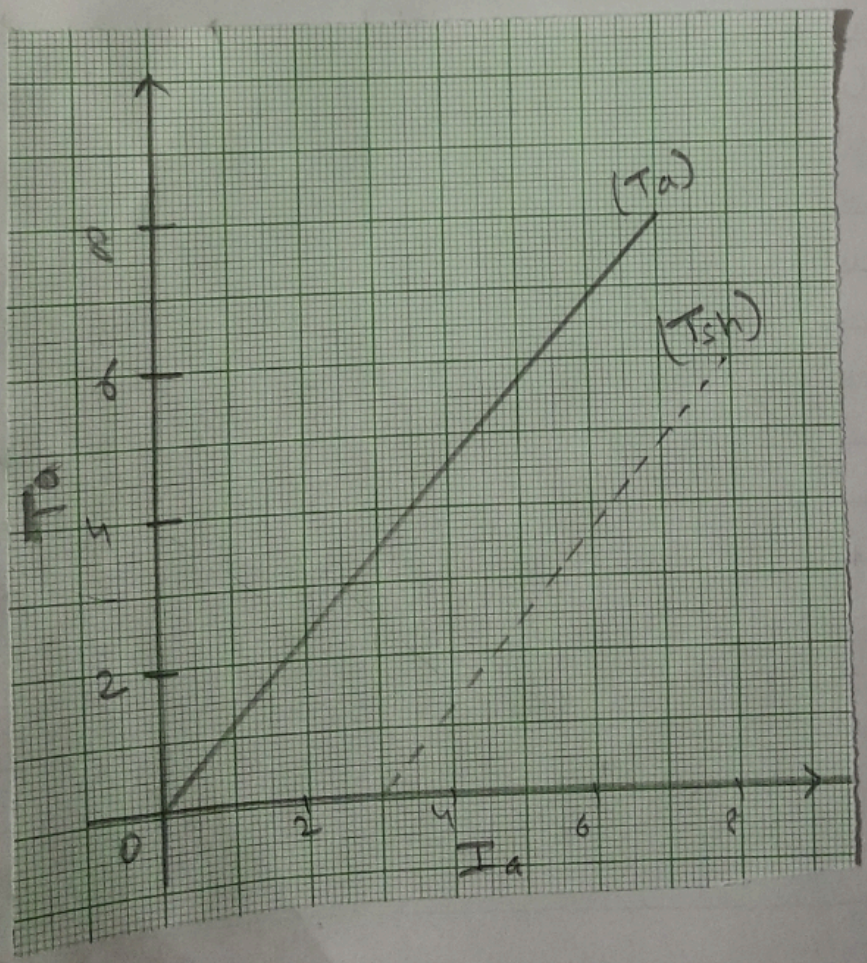
where

$$I_a = I_t - I_{sh} = \frac{E}{R_a}$$

Teacher's Signature :


Speed (N)
1500
1400
0
4
Torque


Speed (N)
1500
1410
2
4
6
8
I_a


(Ta)
(Tsh)
8
6
4
2
0
2
4
6
8
I_a

and emf

$$E_b = \frac{P \phi N Z}{60 A}$$

here,

$P \rightarrow$ no. of poles
$\phi \rightarrow$ flux of each pole with Θ_b
$N \rightarrow$ motor speed (rpm)
$A \rightarrow$ no. of parallel dams
$Z \rightarrow$ no of armature conductors.

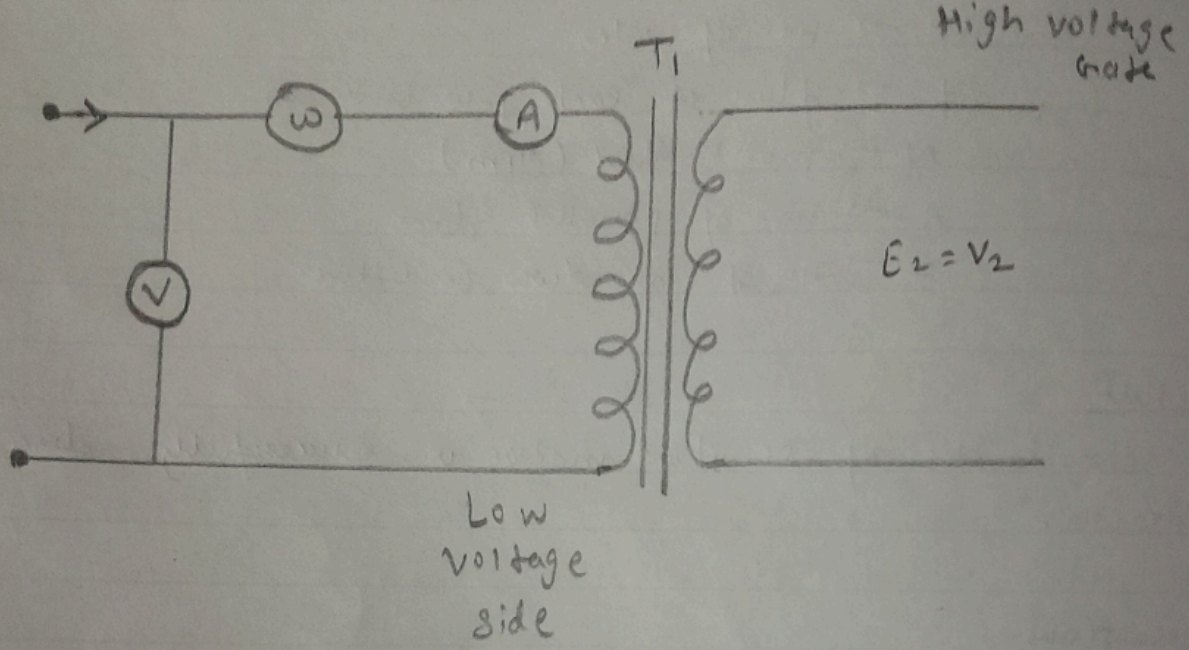
Result

The characteristics of DC shunt motor is succesfully drawn.

Precautions

- Speed should not exceed max. limit.
- Turn the field off by switching off the Ac Power to the field Power, Field on first, field off last.

Teacher's Signature :



Expt. No.

Aim

To st

Equipm

Amm

2 B

Theory

A sin

operat

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circu

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→ V

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Date

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Practical - 4

Aim

To Study open Circuit test on single phase transformer.

Equipment Required

Ammeter, voltmeter, wattmeter, single phase transformer & ~~DPST~~. DPST.

Theory

A single phase tranformer is a type of tranformer which operate on single phase power. A transformer is a passive electrical device that transfer electrical energy from one circuit to another through the process of electromagnetic induction.

→ V_o (No load primary voltage)

→ I_o (No load primary Current)

W_o - No load losses [core losses]

due to small I_o, Copper losses will be very small hence we can't measure Copper losses from open circuit test

$$W_o = I_o V_o \cos\phi_o$$

$$\phi_o = \cos + \left(\frac{W_o}{I_o V_o}\right)$$

Teacher's Signature :

Date

Expt. No. Page.No. 8

$I_c = I_o \cos\phi_o$, $I_u = I_o \sin\phi_o$

$$R_c = R_o = \frac{V_v}{I_c}$$

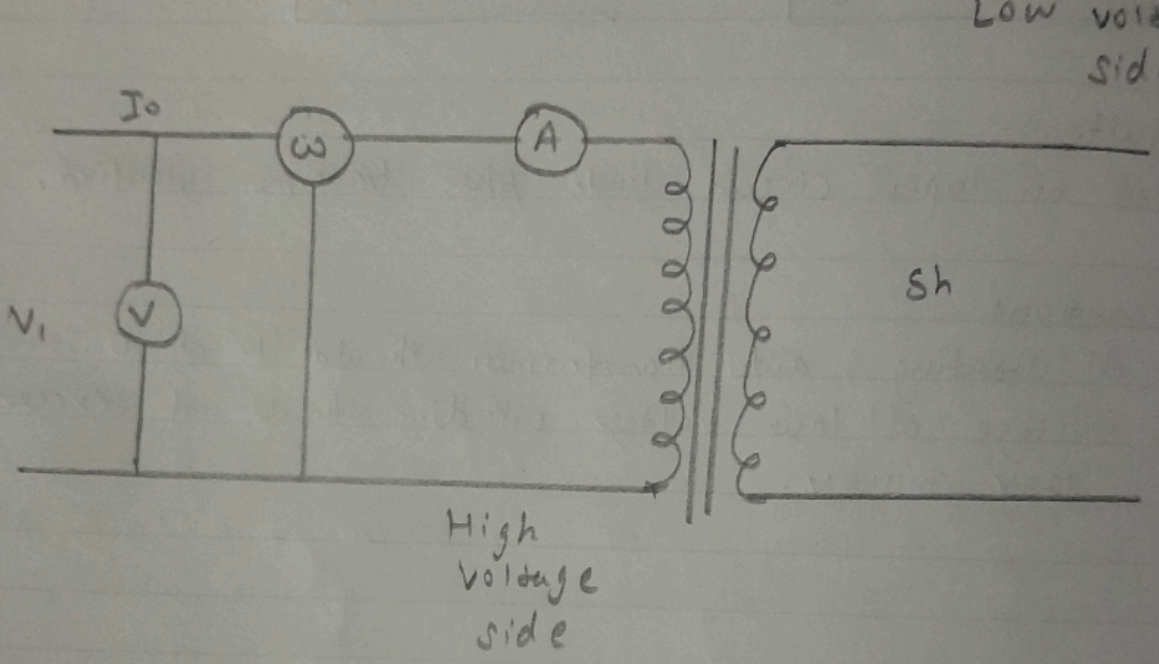
$$X_m = X_o = \frac{V_v}{I_u}$$

Results

Test on open circuit single phase transformer verified.

Precautions

- At starting, auto transformer should be at 0.
- Voltage at low voltage winding should not exceed 120V or 110V.


Low voltage side
I_o
W
A
V_1
V
Sh
High voltage side

Date

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Practical - 5

Aim

To Study short circuit test on single phase transformer.

Equipment Required

Wattmeter, Ammeter, Voltmeter, single phase transformer, and auto transformer.

Theory

It is performed to measure copper losses in a transformer normally performed on high voltage winding short circuiting low voltage windings.

Wattmeter will read copper losses, because of high current pass through windings.

$$W_{sc} = I_{sc}^2 - R_{2e}$$

$$\boxed{R_{2e} = \frac{W_{sc}}{I_{sc}^2}}$$

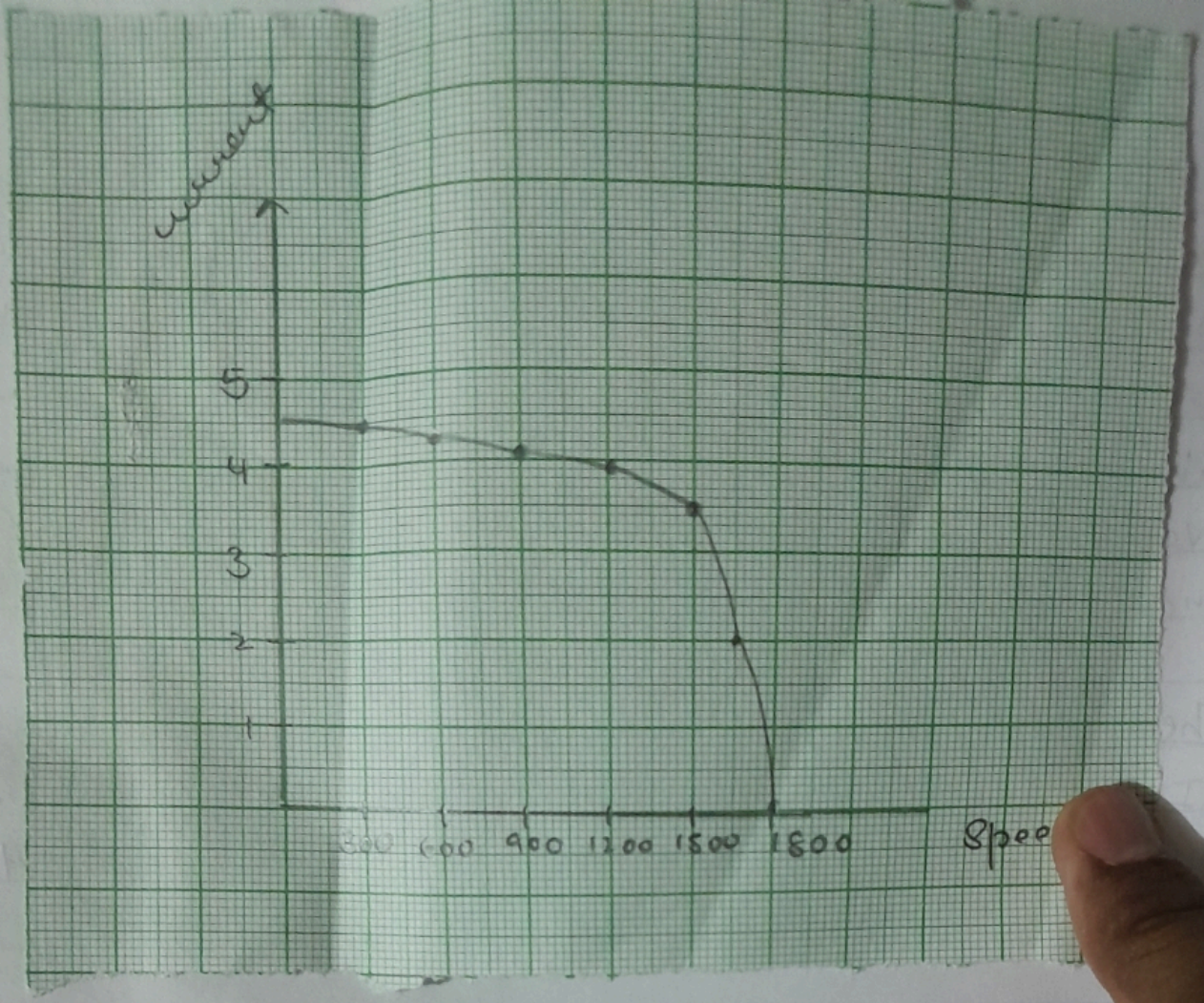
$$Z_{2e} = \frac{V_{sc}}{I_{sc}}$$

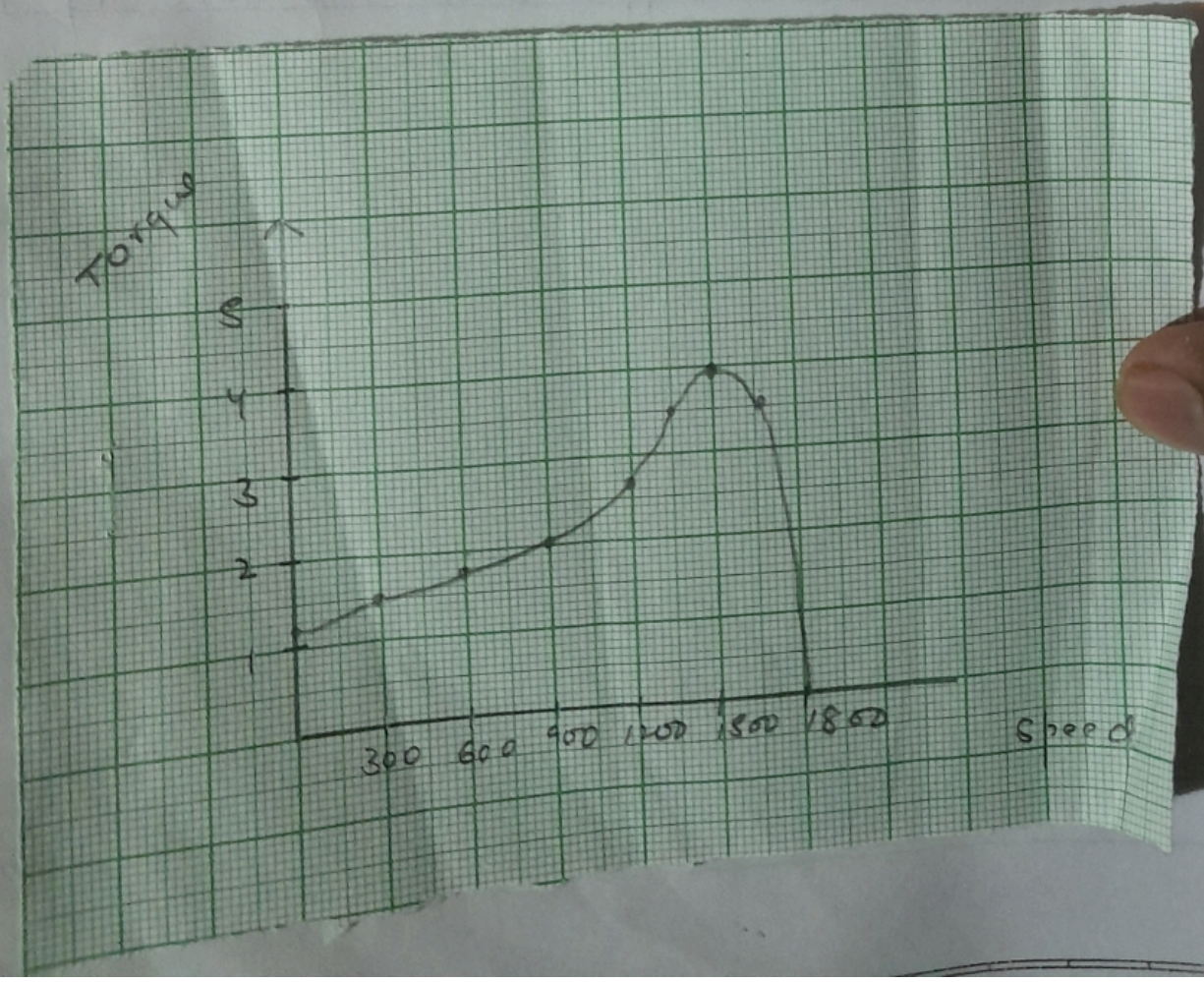
$$X_{2e} = \sqrt{Z_{2e}^2 - R_{2e}^2}$$

Result

Test on short circuit single phase transformer verified.

Teacher's Signature : _____


Current
5
4
3
2
1
900
1200
1500
1800
Speed

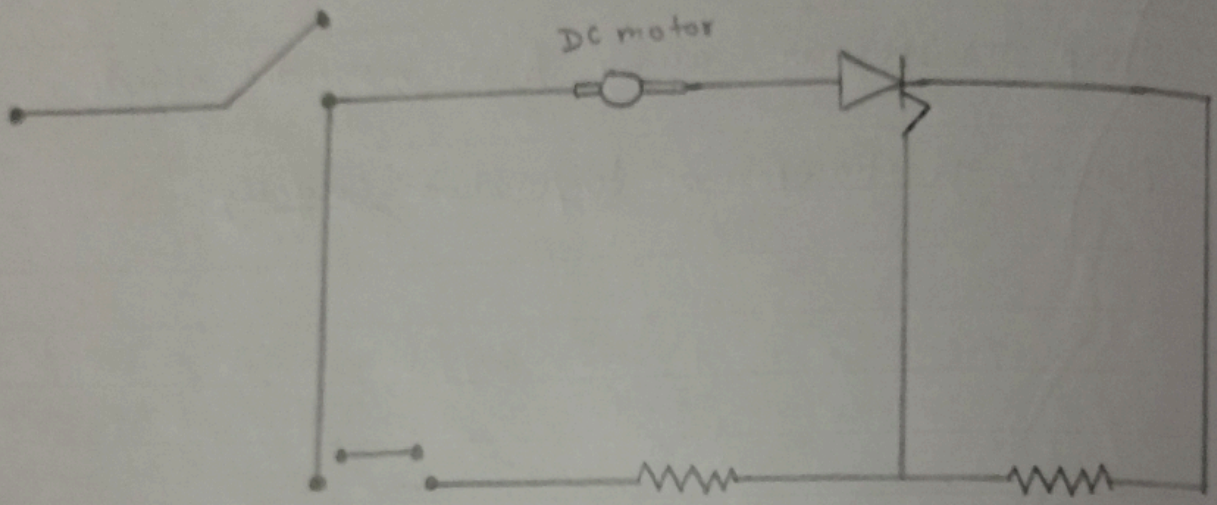

Torque
5
4
3
2
1
300
600
900
1200
1500
1800
Speed

Precautions

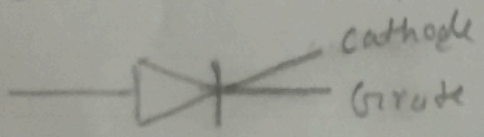
- Power should be disconnected before correcting the transformer to the apparatus
- Keep transformer away from magnetic objects
- Monitor the transformer temperature carefully.

Teacher's Signature : _____

DC motor Control circuit



Anode



Date

Expt. No. 6 Page.No. 11

Practical - 6

Aim

Study the Control of DC motor using SCR.

Equipment Required

DC motor, Oscilloscope, BNC cable & multimeter.

Theory

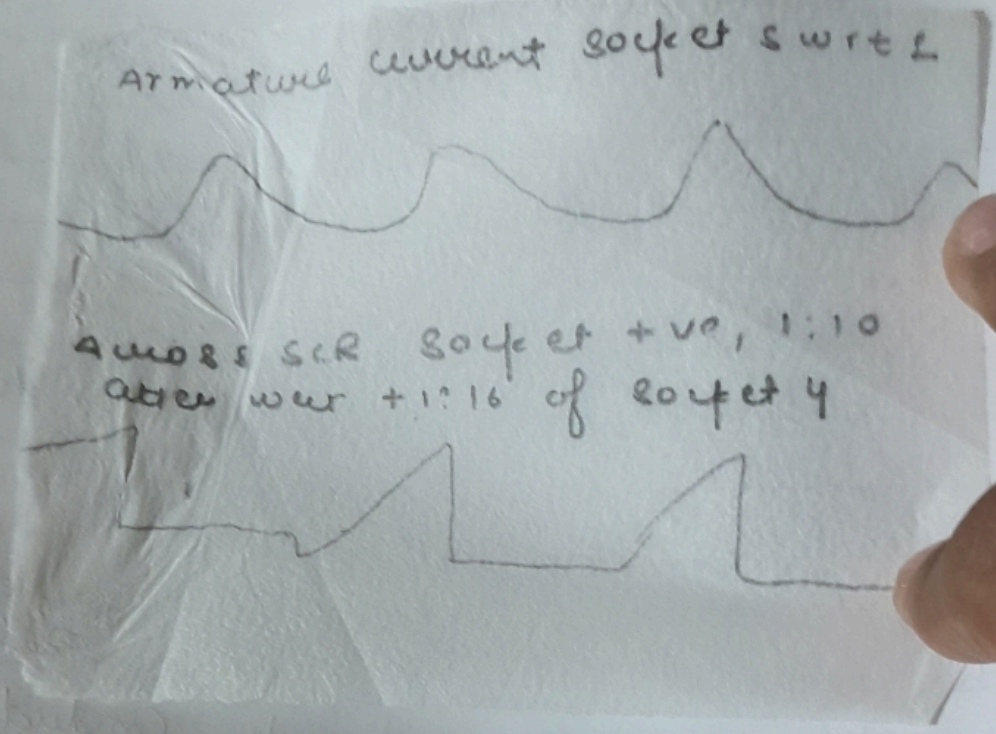
Silicon Controlled Rectifier is a four-layered semiconductor device that conducts current in only one direction. It acts as a bistable switch and only conducts when gate receives a current & they get ~~i~~once the SCR is triggered it remains in a conduction state until we reset it manually.

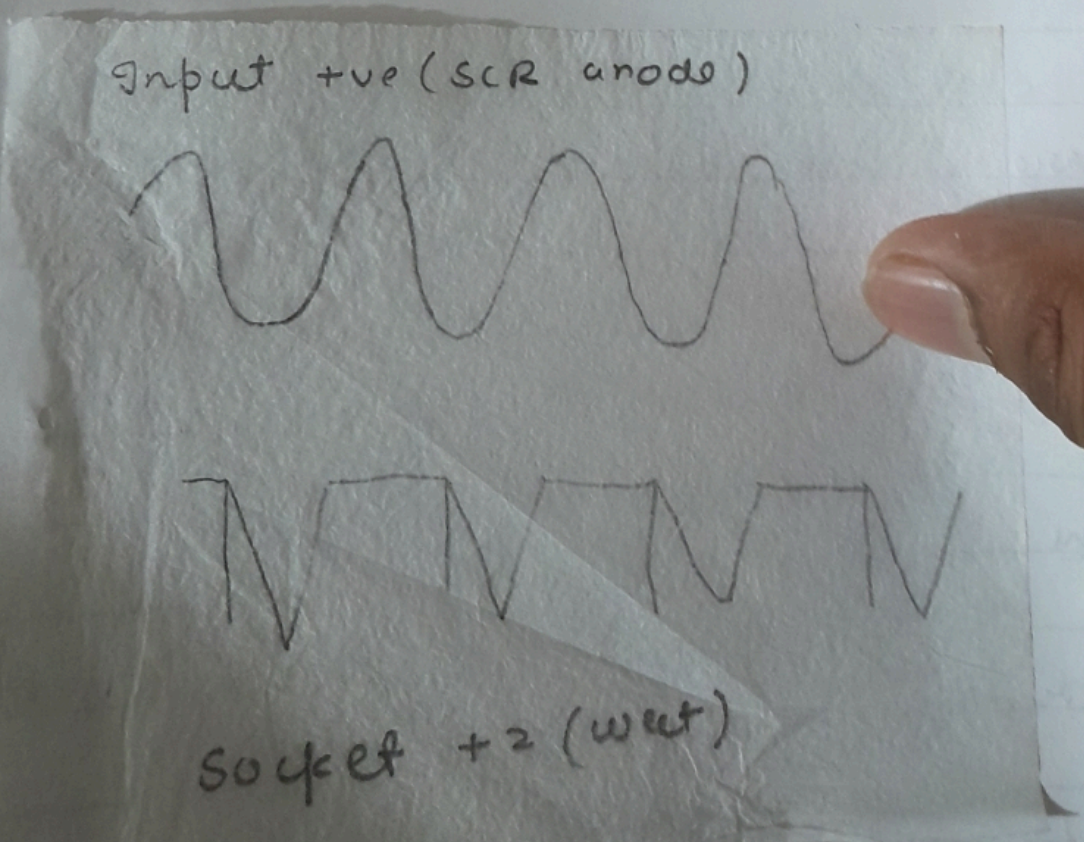
SCR switching circuit can be used to control much largeer loads such as ~~Sample~~ lamps, motor etc. In this practical, we will show how to control a DC motor by using SCR. The motor will start when we will apply pulse to its gate terminal.

Precautions

- Check the connection properly before switching on the power.
- Keep transformer away from magnetic object

Teacher's Signature : _____


Armature current socket 5 w.r.t L
Across SCR socket +ve, 1:10
after wer +1:16 of socket 4


Input +ve (SCR anode)
Socket +2 (wet)

Date

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- Monitor the transformer temperature carefully

Result

Test on short circuit single phase transformer verified.