Power Electronics Laboratory (EE3P004)

EXPERIMENT-9

Speed Control of DC Motor using 3-ϕ Controlled Rectifier

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Aim of the Experiment:

To control the speed of DC motor using 3-phase rectifier

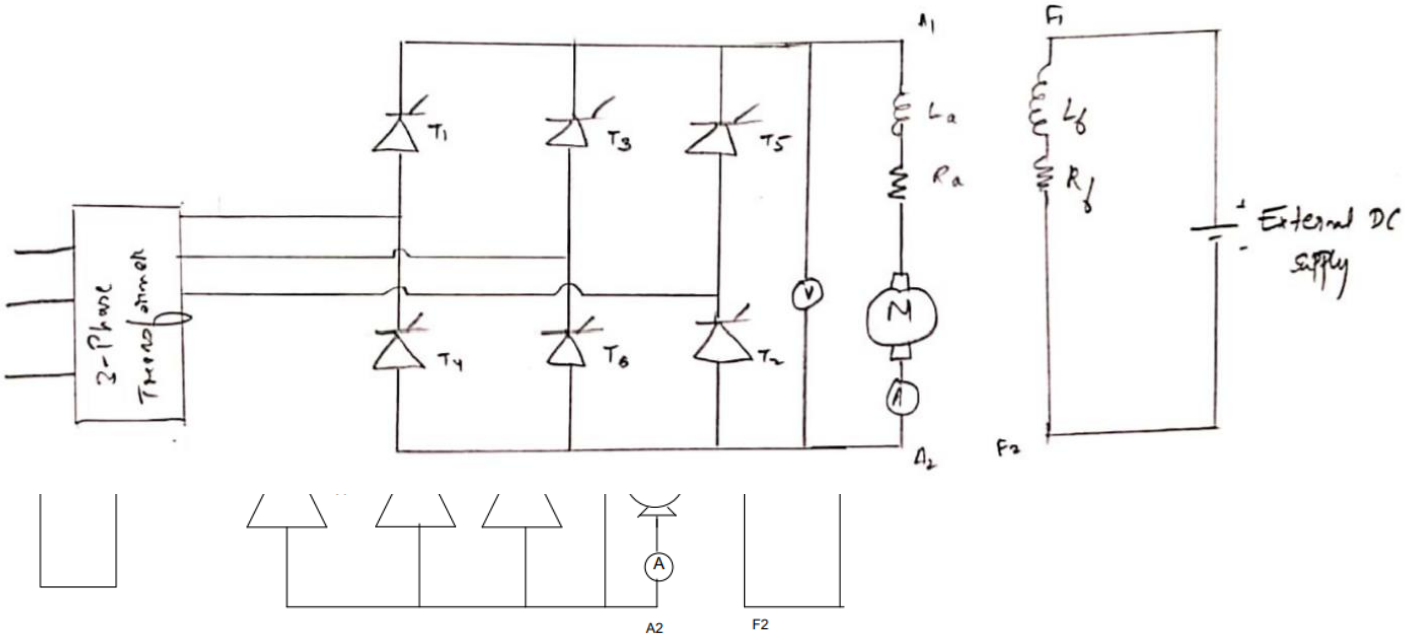
Apparatus Required:

- DC Shunt Motor
- Rectifier KIT
- Connecting Wires

Theory:

- **THREE PHASE CONVERTER FIRING UNIT :**
- The function of this unit is to provide six pulse transformer isolated firing pulses to trigger six thyristors connected in three phase fully controlled bridge converter configuration. This unit can be used for firing thyristors connected in three phase half wave converter ,half controlled converter and also 3-phase AC phase control.
- **THREE PHASE HALF AND FULLY CONTROLLED POWER CIRCUIT :**
- This power circuit consists of six SCR's & four diodes. These devices can use to built three phase half wave converter. Three phase half controlled bridge converter and three phase fully controlled bridge converter and also three phase AC voltage controller power circuits.
- A free wheeling diode is provided to observe the effect of free wheeling diode on inductive loads. Each device in the unit is mounted on an appropriate heat sink and is protected by snubber circuit. Short circuit protection is achieved using HRC fuses. A circuit breaker is provided in series with the input supply for over load protection and to switch ON/OFF the supply to the power circuit.
- The gate and Cathode of each SCR's brought out on the front panel for firing pulse connection.
- A Digital voltmeter and an Ammeter is mounted on the front panel to measure the output voltage and current. A separate full wave bridge rectifier is provided in the unit to get the DC supply for the field of DC shunt motors. The power circuit schematic is printed on the front panel. DC shunt motors.

Circuit Diagram:



Observation Table:

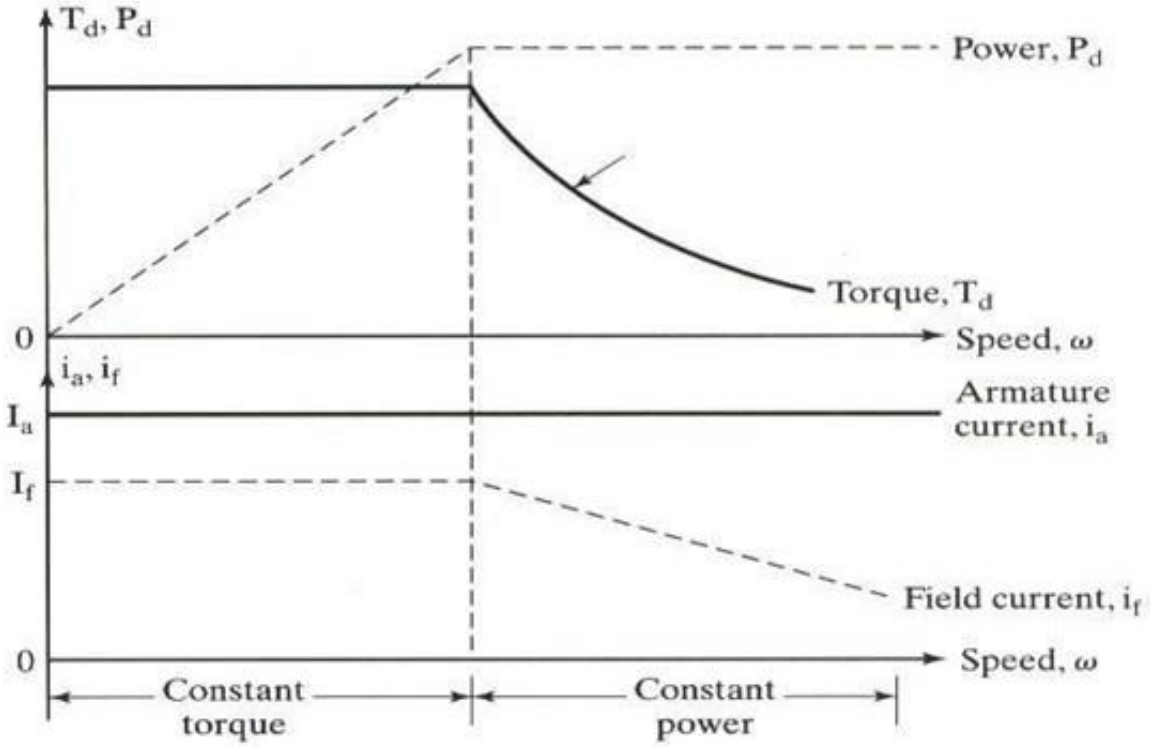
- WITH LOAD

Vf (V)	Vin (V)	Firing Angle(Degrees)	Va (V)	Ia (A)	Speed (rpm)	Load(W)
195.3	100.6	90	12	0.8	74.8	200
195.3	100.6	60	62	0.96	427.5	200
195.3	100.6	30	102	1.37	709.5	200
195.3	100.6	0	112	1.6	773.9	200

- WITHOUT LOAD

Vf (V)	Vin (V)	Firing Angle(Degrees)	Va (V)	Ia (A)	Speed (rpm)	Load(W)
195.3	100.8	90	16	0.8	107.1	0
195.3	100.8	60	66	0.82	458.9	0
195.3	100.8	30	106	1.29	740.1	0
195.3	100.8	0	116	1.42	783.2	0

Relevant Plots:



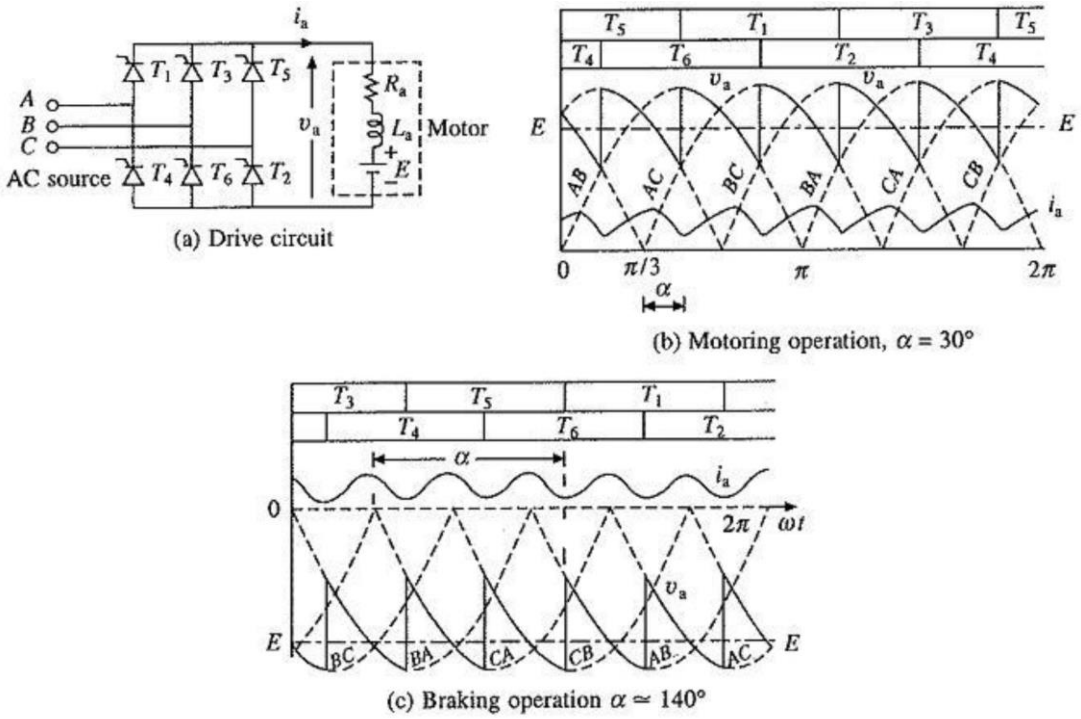


Fig. 5.32 Three-phase fully-controlled converter control of separately excited motor

Waveforms:

ARMATURE VOLTAGE AT NO LOAD

ARMATURE VOLTAGE AT LOAD

CONCLUSION

This experiment was conducted successfully and different armaturevoltages and current and speed was observed at different firing angles for both no load and load conditions.