SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF MECHATRONICS

19MCB302 – INDUSTRIAL ELECTRONCIS & APPLICATION

III YEAR V SEM

UNIT 2 – PHASE CONTROLLED CONVERTERS

TOPIC –AC Voltage Regulator

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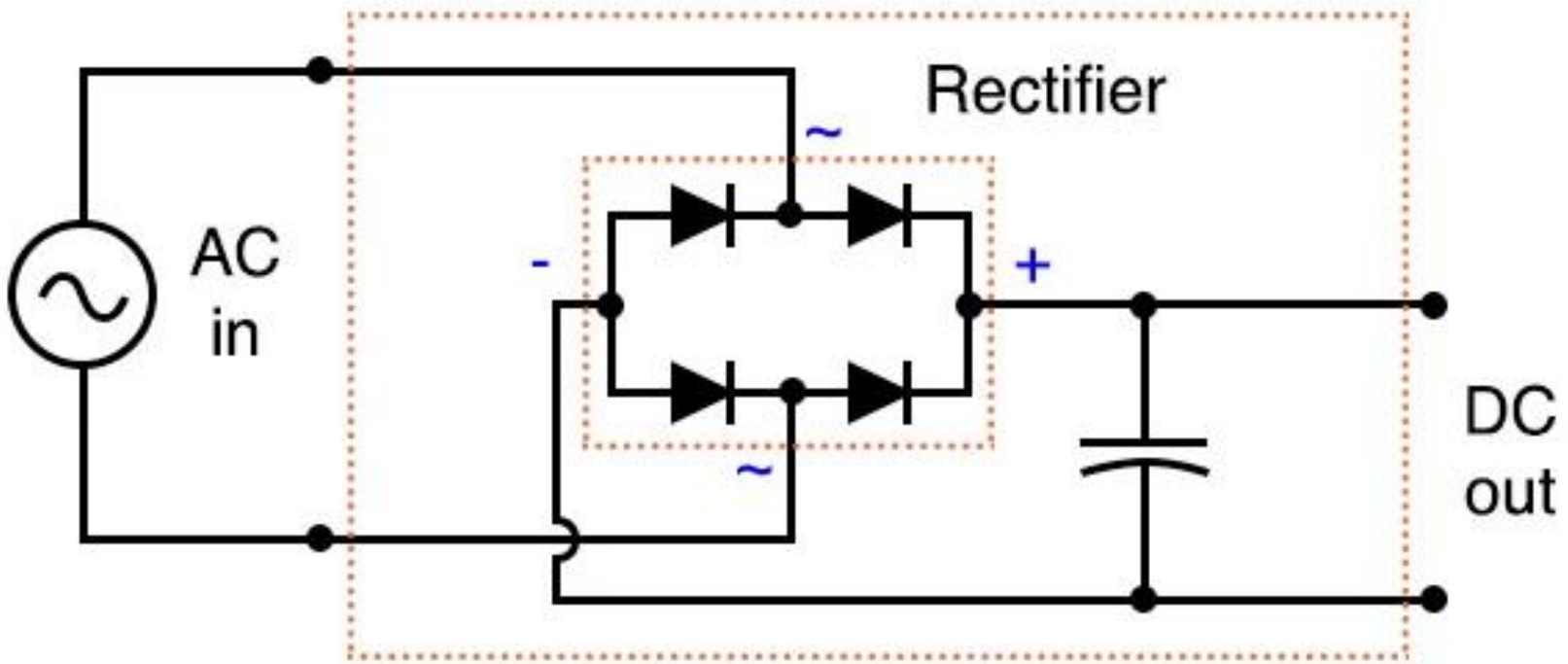
SNSCT, Coimbatore.

REVISION



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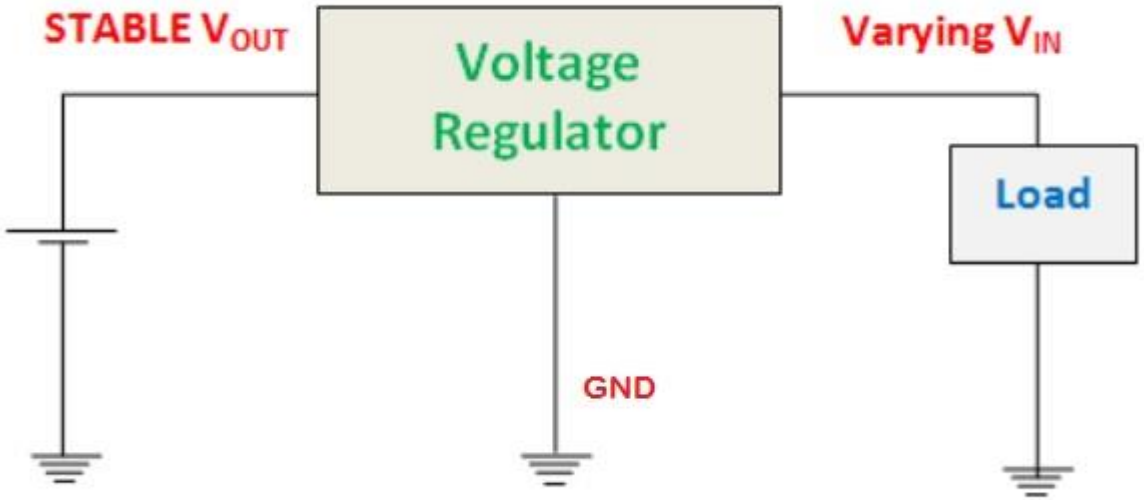
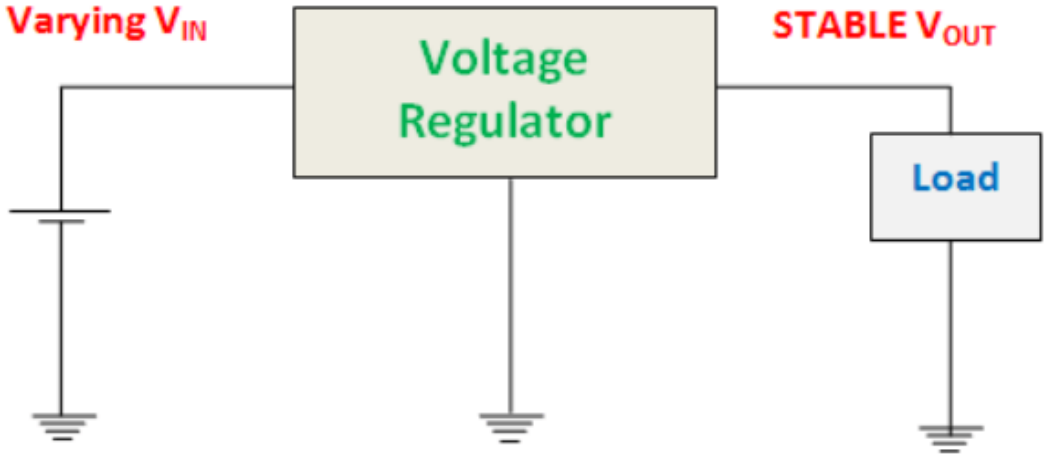
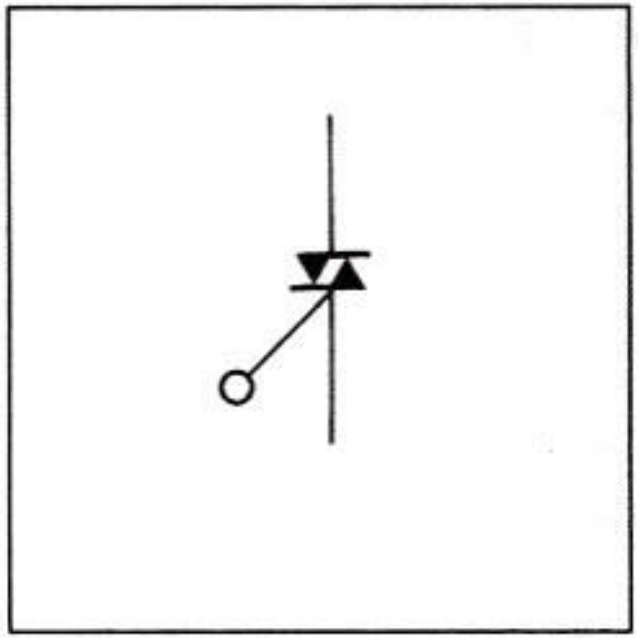
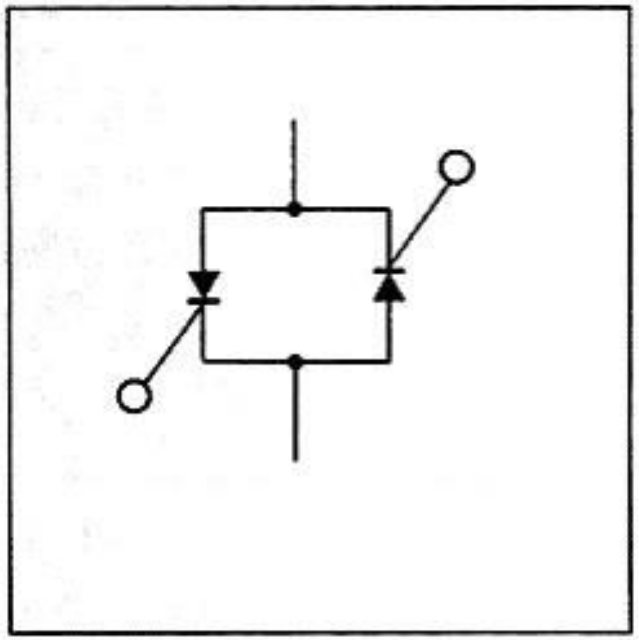
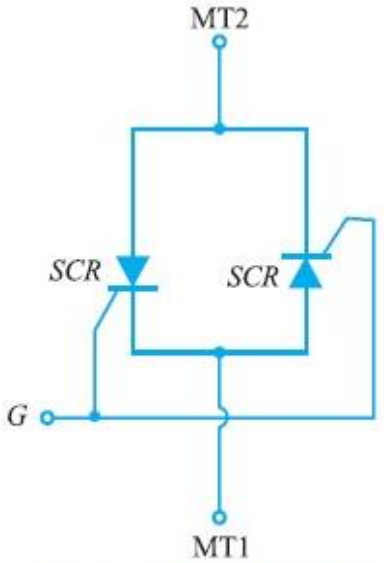

STABLE V_{OUT}
Voltage Regulator
Varying V_{IN}
Load
GND


Varying V_{IN}
Voltage Regulator
STABLE V_{OUT}
Load

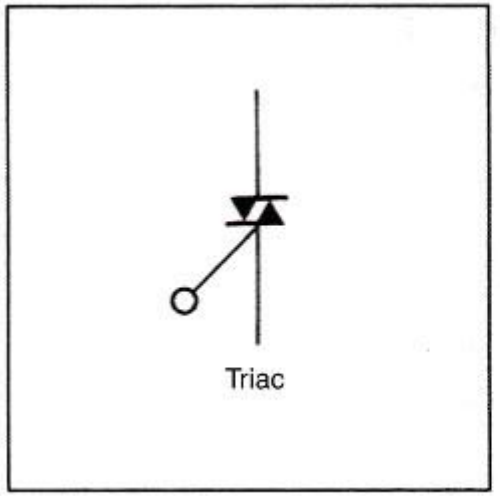
REVISION



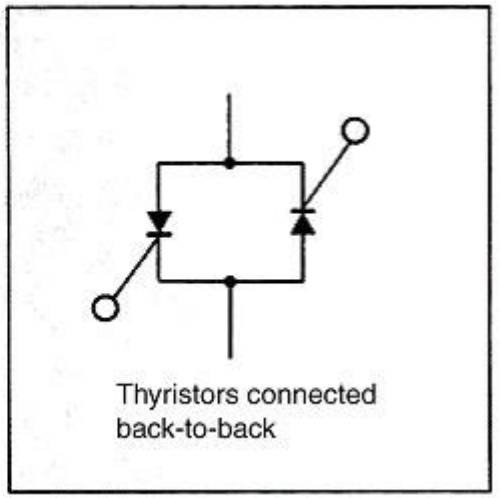




SCR equivalent of Triac



Triac



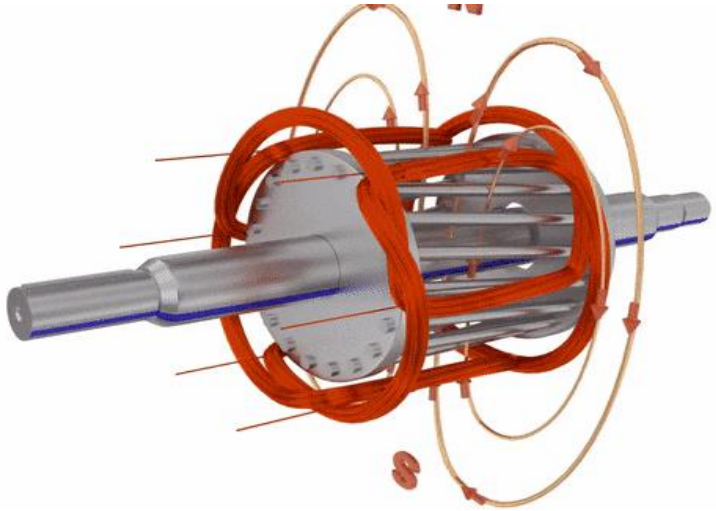
Thyristors connected back-to-back

APPLICATION

SPEED CONTROL OF INDUCTION MOTOR BY STATOR VOLTAGE CONTROL

Stator Voltage Control is a method used to control the speed of an **Induction Motor.** The speed of a three phase induction motor can be varied by varying the supply voltage. As we already know that the torque developed is proportional to the square of the supply voltage

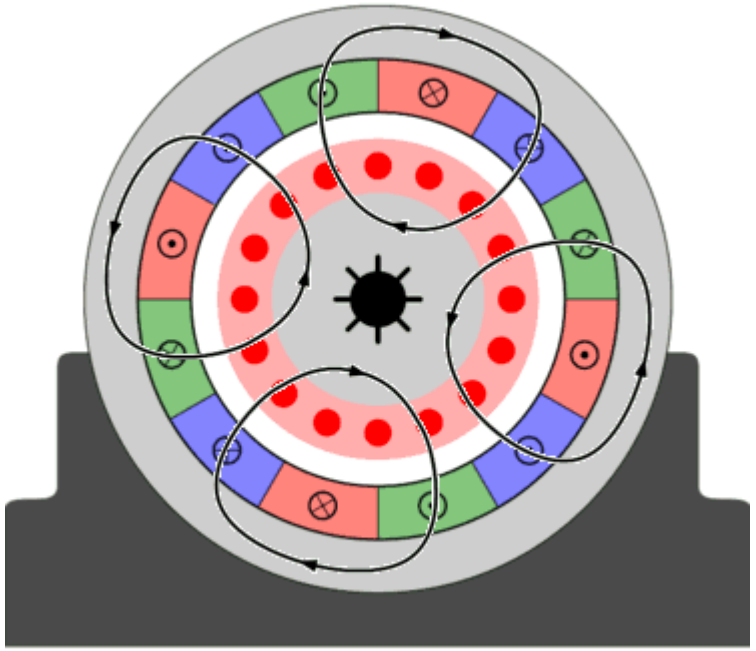
$$T_d \propto V_1^2$$



SPEED CONTROL OF INDUCTION MOTOR BY STATOR VOLTAGE CONTROL

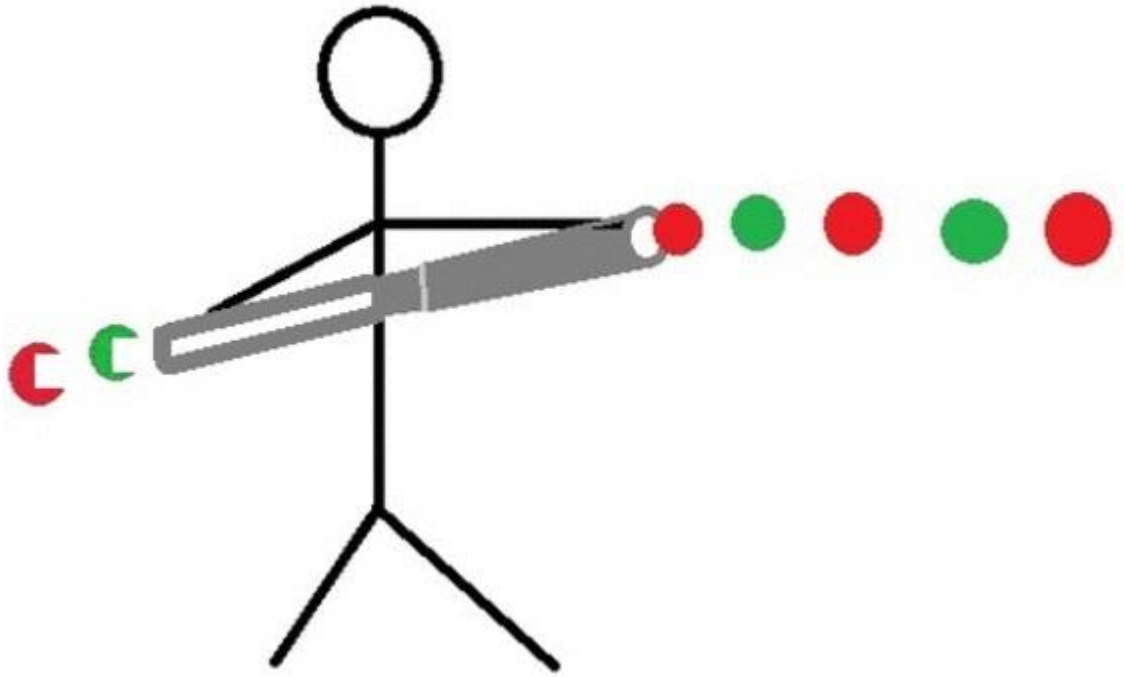
The variable voltage for speed control of small size motors mainly for single phase can be obtained by the following methods given below.

- By connecting an external resistance in the stator circuit of the motor.
- By using an Auto transformer.
- By using a Thyristor (SCR) voltage controller

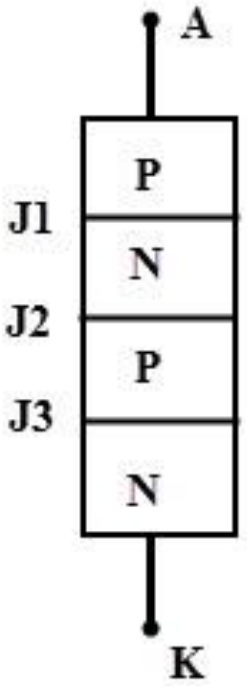


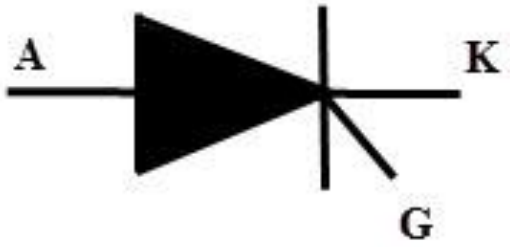
SCR

The Silicon Controlled Rectifier (SCR) is the most important and mostly used member of the thyristor family. SCR can be used for different applications like rectification, regulation of power and inversion, etc. Like a diode, SCR is a unidirectional device that allows the current in one direction and opposes in another direction



SCR


A
P
J1
N
J2
P
J3
N
K


A
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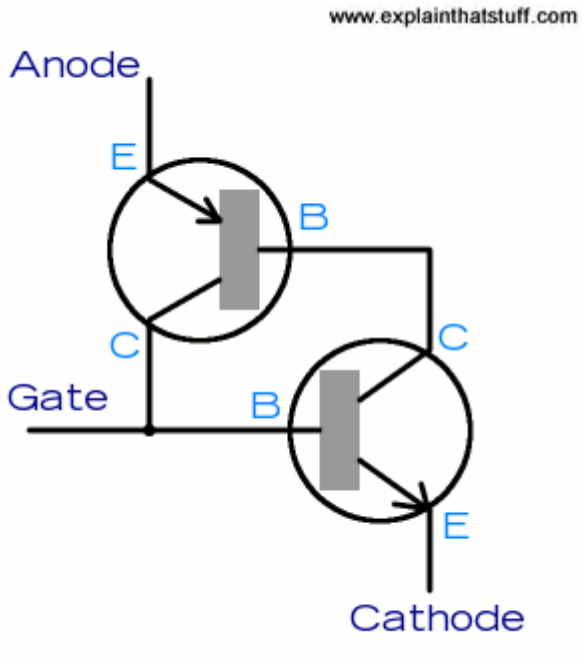
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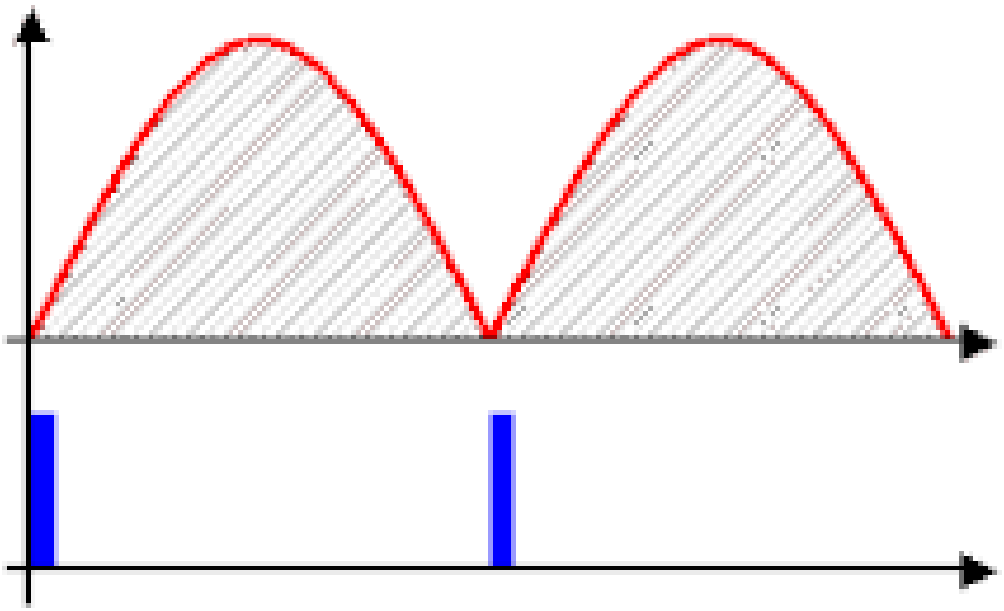
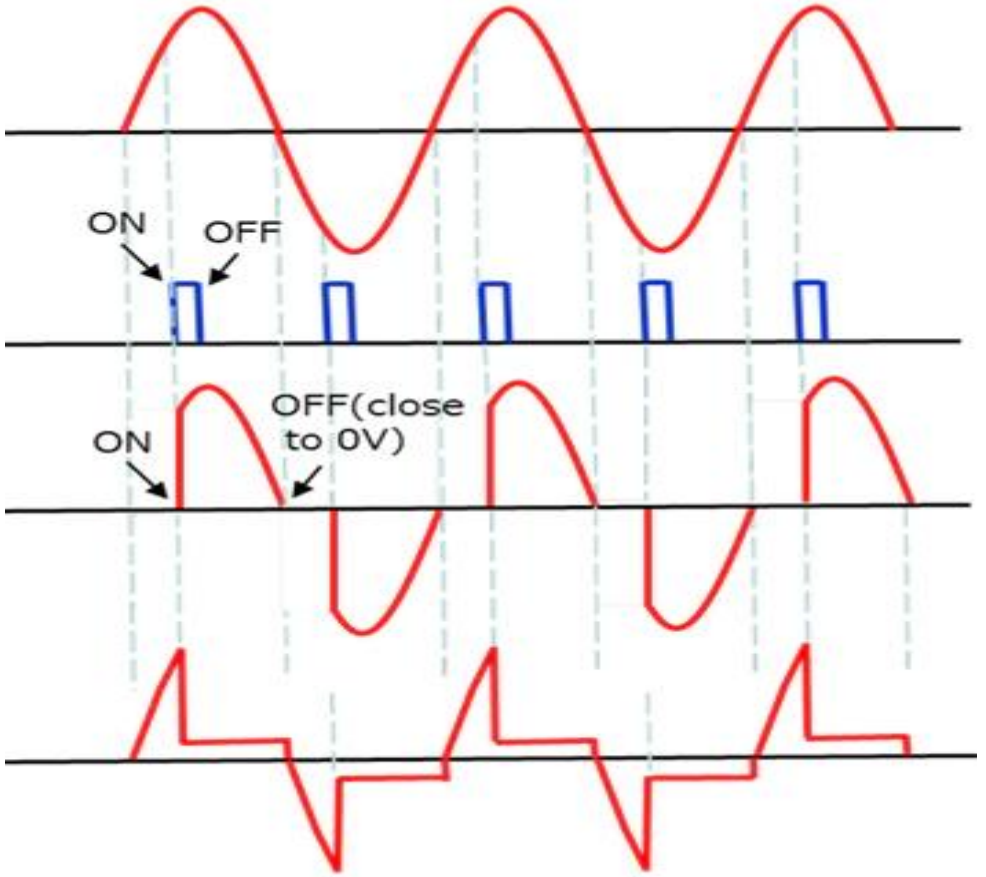
Anode
E
B
C
C
Gate
B
E
Cathode

1

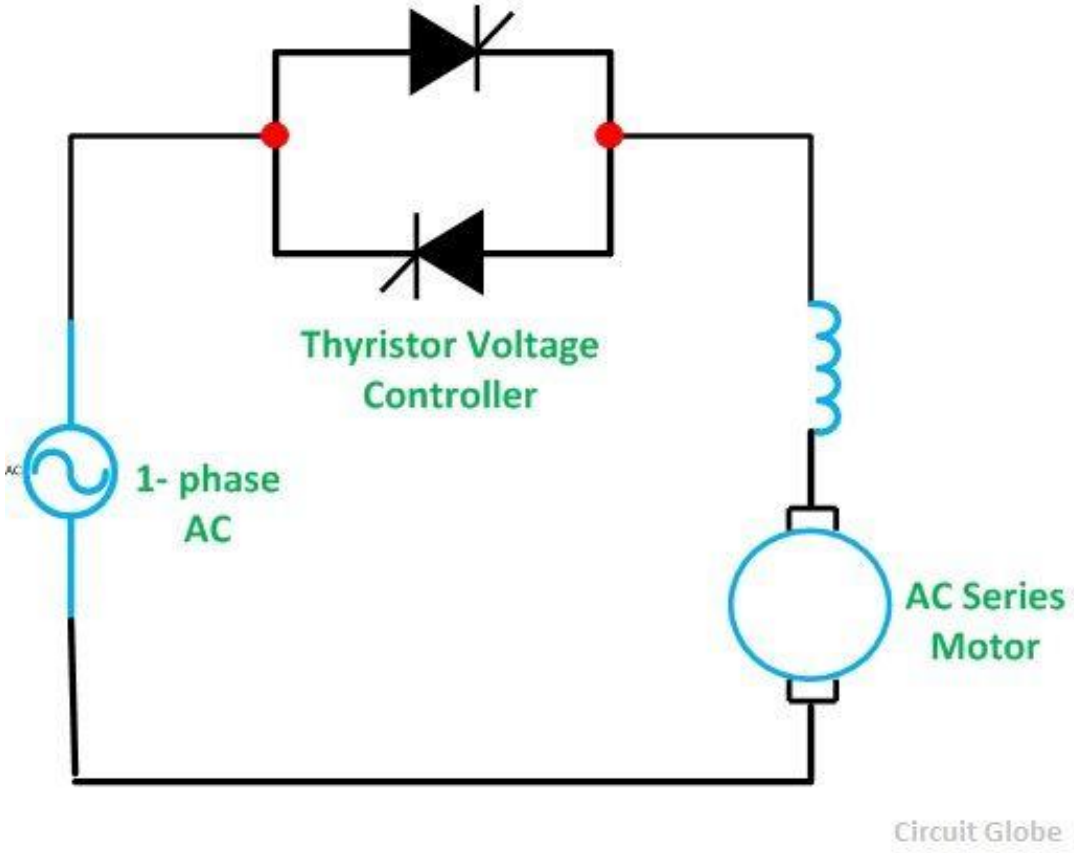
Waveform

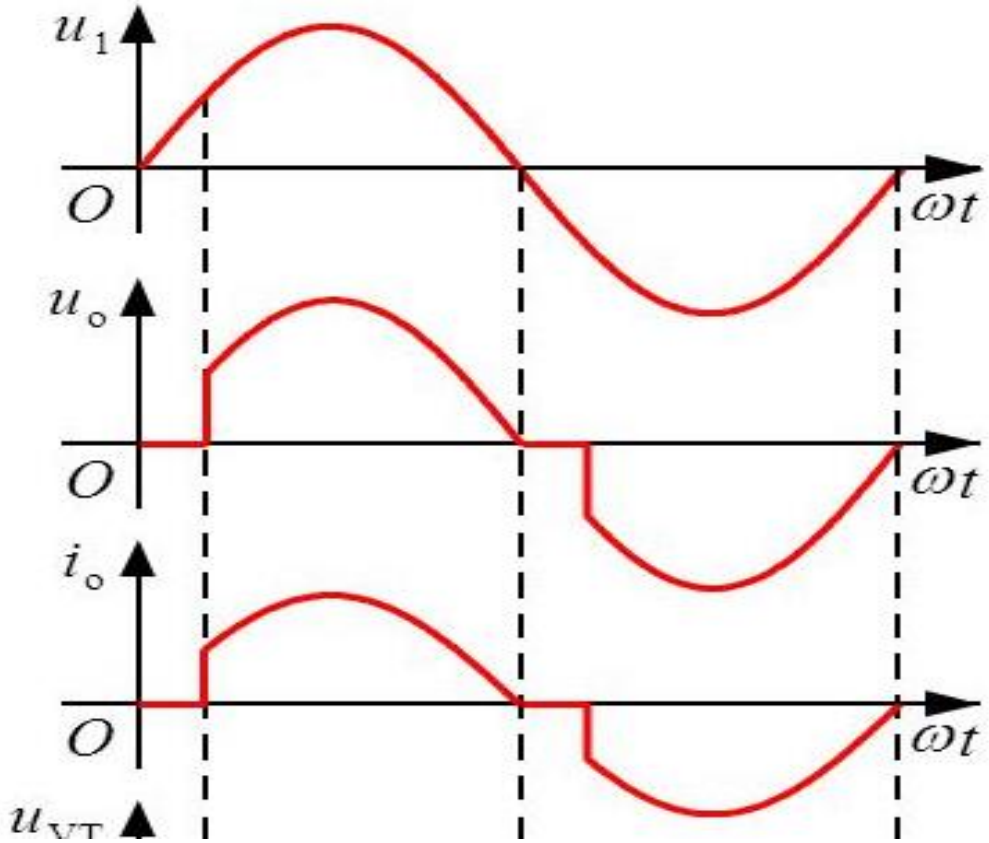




Single Phase Induction motor using SCR.

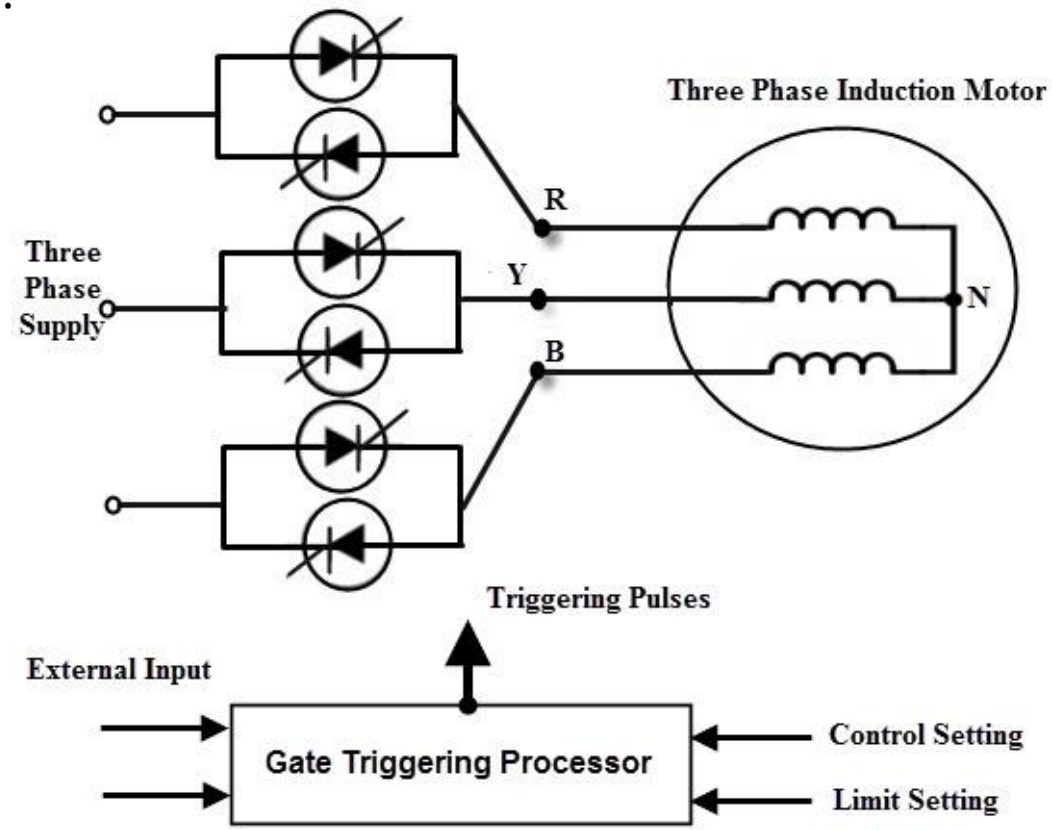
For a single phase supply, two Thyristors are connected back to back as shown in the figure below.





AC Motor Control Using SCR

An AC induction motor speed is controlled by varying the stator voltage applied to it. The below figure shows the connection of SCR for varying the voltage applied to the stator of induction motor.



Advantages of Silicon Controlled Rectifier

As compared with electromechanical or mechanical switch, SCR has no moving parts. Hence, with a high efficiency it can deliver noiseless operation.

The switching speed is very high as it can perform 1 nano operations per second.

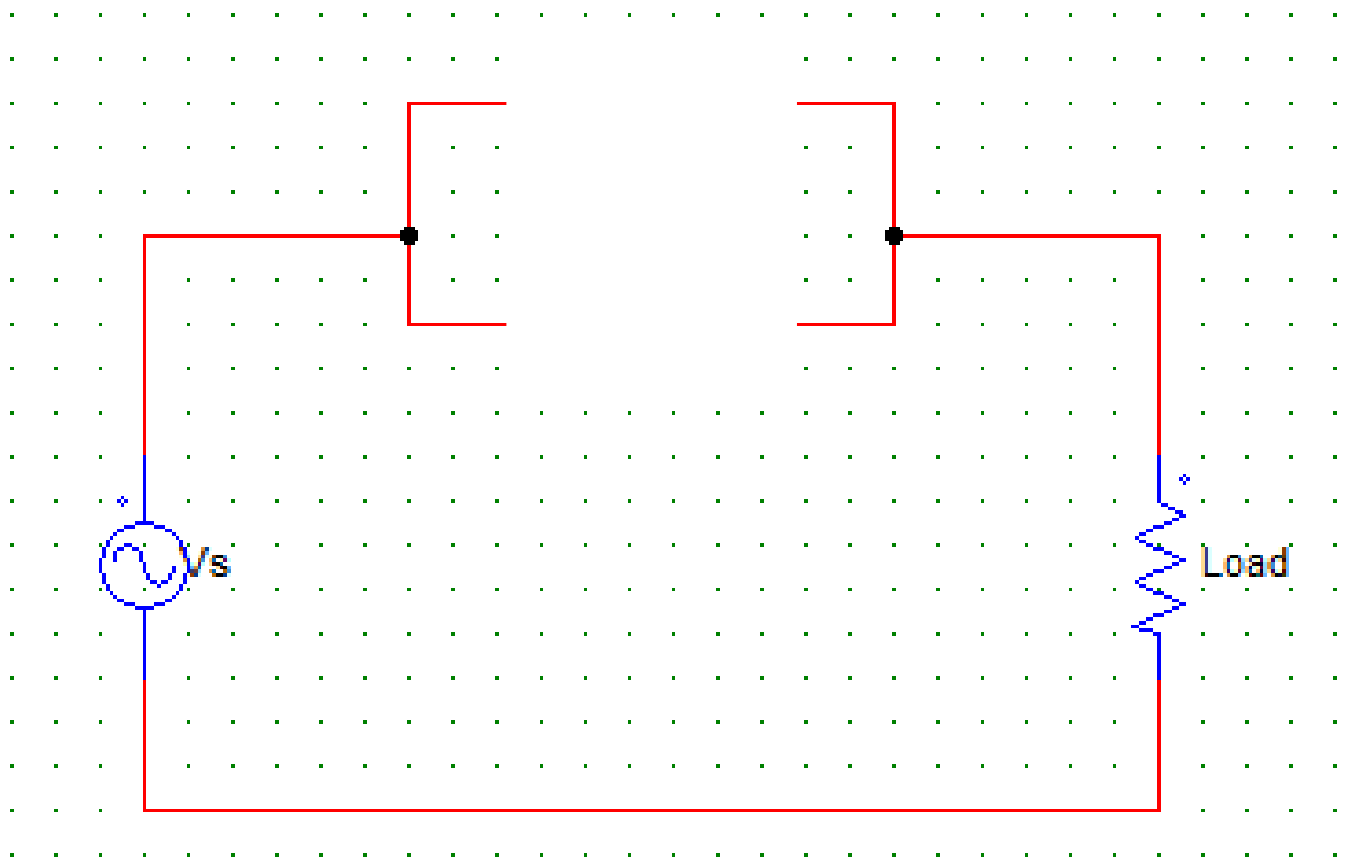
These can be operated at high voltage and current ratings with a small gate current.

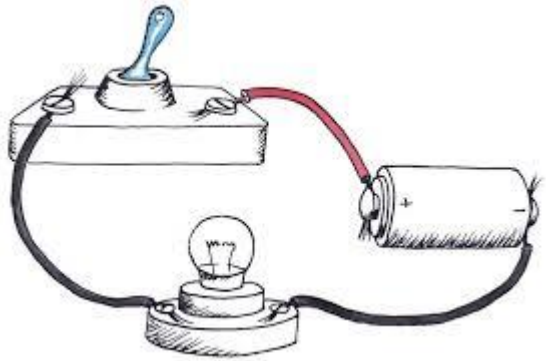
More suitable for AC operations because at every zero position of the AC cycle the SCR will automatically switch OFF.

Small in size, hence easy to mount and trouble free service.

ASSESSMENT

Complete the Circuit Diagram





References

1. https://www.britannica.com/technology/voltage-regulator
2. https://www.analog.com/en/technical-articles/how-voltage-regulator-works.html
3. https://www.youtube.com/watch?v=kLJ3PFwG85M
4. https://www.youtube.com/watch?v=9-FNm5YyRLw
5. https://www.youtube.com/watch?v=gD3NuSo8DY4