# EXPERIMENT NO.5

OBJECTIVE: To control the given 3-phase induction motor using inverter module and SCR AC regulator module with PC interface.

APPARATUS REQUIRED:

1. PC based AC Motor control unit (Powercon Make)
2. Serial Link (both side female) cable
3. FAN-AC motor with 4 pin Jone's Plug
4. Lamp – 230V, 25/40 W
5. PC with VB 6 and windows XP / win 98 system, serial ports COM-1 and COM-2 with 9 pin D type connectors
6. SOFTWARE CD- WITH VB PROGRAM –PRJLS.EXE
7. UNEARTHED C.R.O. with probes.

PC based AC Drive

Phase R

Phase Y

Phase B

M
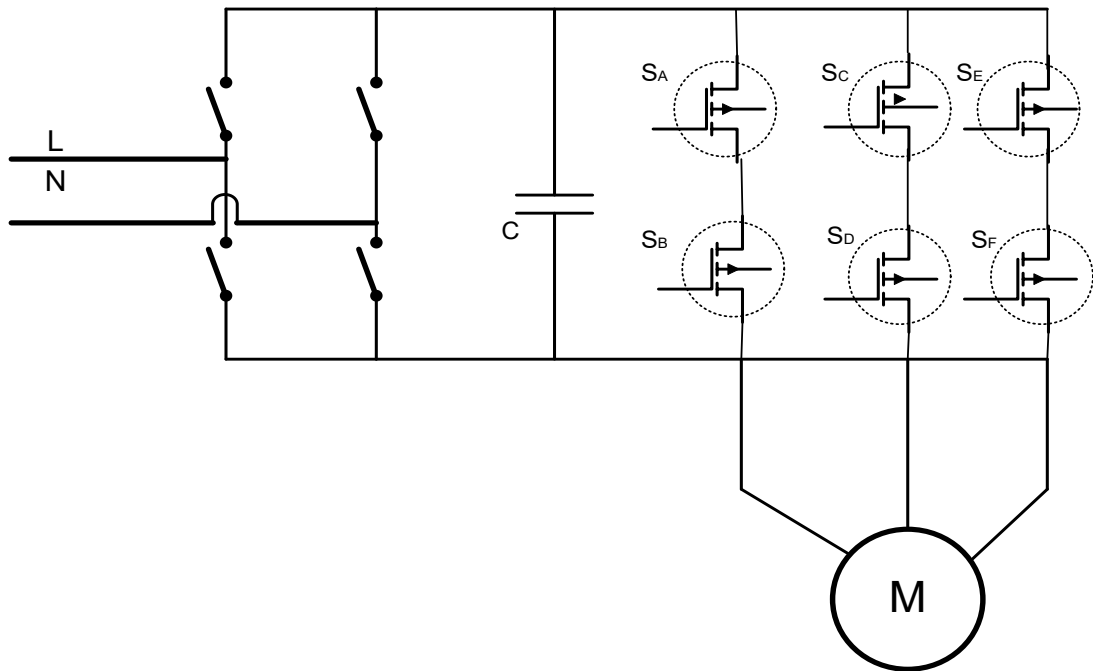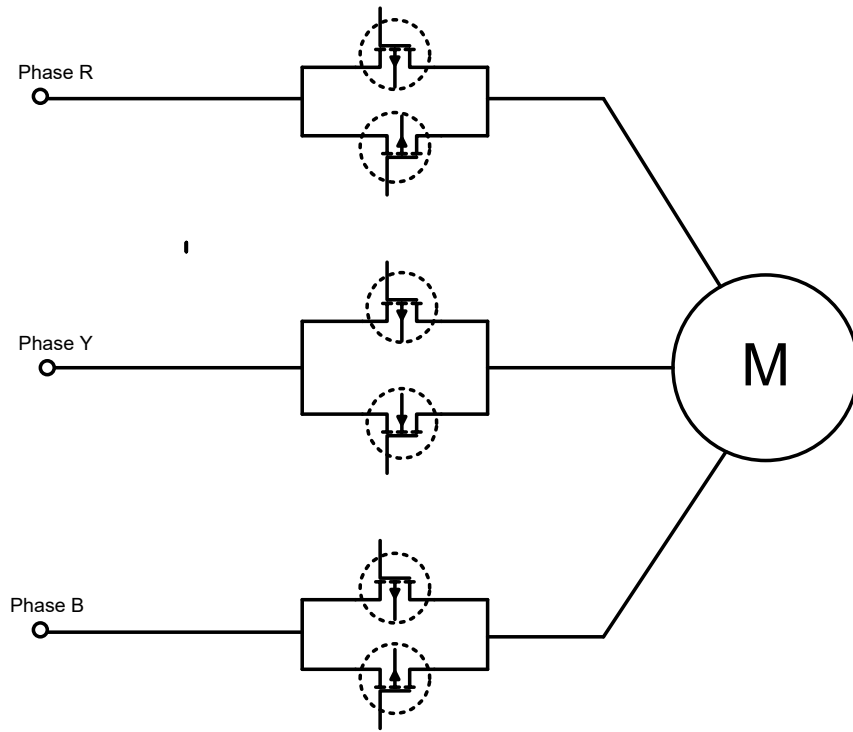
THEORY:

The various methods of speed control of an Induction Motor are as stated below:

1. Stator voltage control.

2. Variable voltage, variable frequency control

3. Rotor Resistance control

4. Slip power regulation

Among all above methods, the stator voltage control is the simplest. In this scheme, two thyristors are connected in anti-parallel configuration in each phase as shown in Fig.1. Speed control is obtained by varying the firing angle of the thyristors. The effective control takes place for $\pi/2 < \alpha < 5\pi/6$. For complete control, the trigger pulse width should be 'π-α' and not less than $\pi/3$.
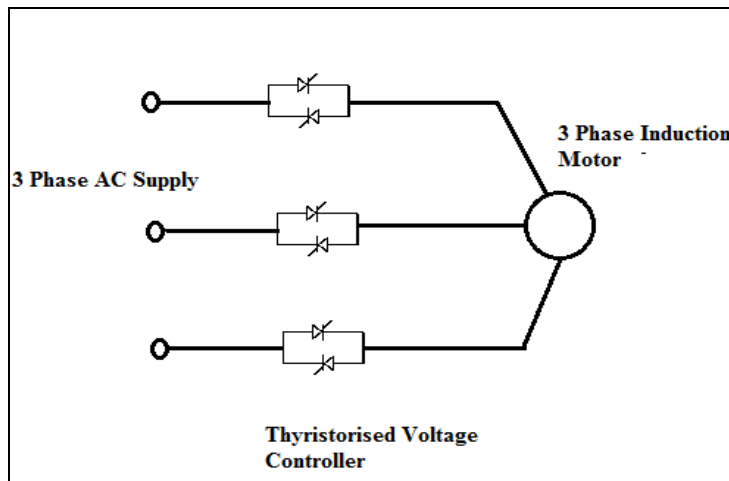
Fig. 1: Stator voltage control by Thyristorised Voltage Controller

PROCEDURE:

Step 1: Hardware connections

1. Connect MAINS cord to 230V ac.
2. Connect Motor to unit at Front Panel 4 pin connector.
3. Connect one end of Serial Cable to back panel of Unit.
4. Connect other end of Serial Cable to PC COM 1 or 2 whichever available. (Chose VB program CM1 or CM2 according to your connections).
5. Insert a 25 /40W lamp into Back panel holder.
6. Take a CRO without Earth PIN (UNEARTHED CRO OR POWERSCOPE) & connect a CRO Probe X10 mode to TP 10 – TP 11.

Step 2: Running program, commands and observations

1. Keep toggle switch on front panel in **PC Control** position.
2. Switch ON Mains.
3. Switch ON PC and RUN (double click) prjls.exe file. FORM-1 window appears.
4. Enter a number into '%O/P / firing angle' window. It should be a number in 2 digits from 01 to 99.
5. Press '%O/P / firing angle' Button.
6. Press" START" Button.
7. Observe motor speed, Lamp intensity and O/P waveforms on CRO.
8. Try to Put another value into o/p and see the effect. for this- ENTER No. PRESS '%O/P / firing angle' and then press 'START'.

OBSERVATION TABLE:

Motor Load

OUTPUT SET	ACTUAL FIRING ANGLE (OBSERVED ON C.R.O.)	MOTOR VOLTAGE V AC	MOTOR CURRENT I AC	MOTOR SPEED RPM
99	LIMITED TO MAX			
80	LIMITED TO MAX			
70	LIMITED TO MAX			
60				
50				
40				
30				
20				
10				

R - LOAD – 40 W (MOTR DISCONNECTED)

OUTPUT SET	ACTUAL FIRING ANGLE (OBSERVED ON C.R.O.)	VAC
99	LIMITED TO MAX	
80	LIMITED TO MAX	
70	LIMITED TO MAX	
60		
50		
40		
30		
20		
10		

CONCLUSION:

TEST POINTS DISCRIPTION:

TEST POINT	DESCRIPTION
TP 1 WRT GND	POT reference VTG 0 ~ 5VDC
TP 2 WRT GND	Soft Start – 0 ~ 10 VDC

TP 3 WRT GND	Error Amp –0 ~- 10 VDC
TP 4 WRT GND	Firing Command – 0 ~ 10Vdc
TP 5 WRT GND	NC
TP 6 WRT GND	Full Wave 12 V
TP 7 WRT GND	Ramp –12V, 10 m sec
TP 8 WRT GND	Firing pulse +/- 12Vdc
TP 9 WRT GND	Chopped Firing Pulse 12 V
GND	CONTROL CCT GROUND
TP 10 WRT TP11	MOTOR Voltage / Output voltage waveform (230V AC)