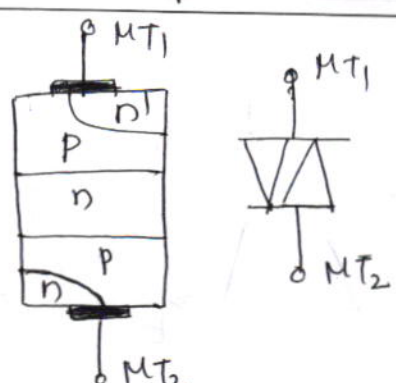


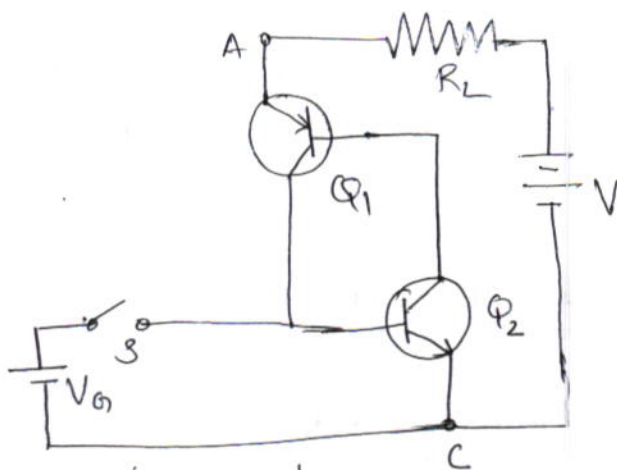
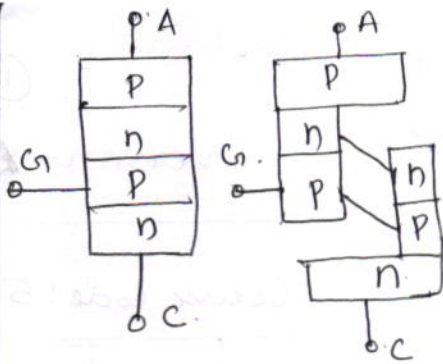
Revision: 2015

Course Title: POWER ELECTRONICS

Course Code: 5032

Qn No.	Scoring Indicator	Split up Score	Sub Total	Total
	<u>PART-A</u>			
I(1)	The minimum anode current below which the SCR is turned off from on condition is called holding current	2	2	
I(2)	① phase control ② pulse generation ③ switching ④ timing circuits ⑤ Over voltage detector	any two 2x1	2	
I(3)	1. Stator frequency control 2. Stator voltage control 3. V/f Control	any two 2x1	2	
I(4)	Inverter is a device which converts dc into ac	2	2	
I(5)	Linear Power supply 1. Efficiency is low 2. large size 3. Simple	SMPS 1. Efficiency is high 2. Small size 3. Complicated	any two 2x1	
II(1)	 <p>Diode is a ^{bidirectional} two terminal switching device. If MT₁ is the w.r. to MT₂ and the voltage applied exceeds breakover voltage, then the section pnpn conducts. If MT₂ is the w.r. to MT₁ and the voltage applied exceeds the breakover voltage the section pnpn conducts when conducting it acts like a low resistance and when not conducting it acts like an open switch</p>	<p>fig: 3.</p> <p>Exp 3.</p>	6.	10

II(2)



2

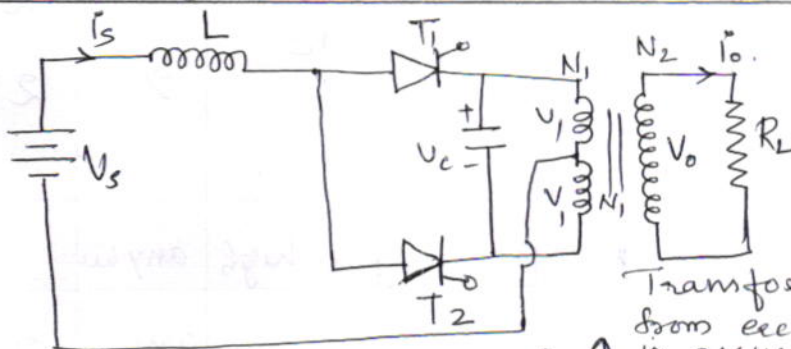
Fig: 3

Exp 3

6.

When gate is open there is no base current in the transistor Q_2 . Therefore no current flows in the collector of Q_2 and hence no current flows in the collector of Q_1 . Under this condition SCR is open. When trigger pulse is applied at the gate, base of Q_2 is forward biased and current flows in the collector of Q_2 which causes the base current of Q_1 . Thus current flows through the collector of Q_1 . But the collector current of Q_1 is the base current of Q_2 . A regenerative action takes place and drive both transistors into saturation. Thus the SCR conducts and the value of current is limited by the external resistance.

II(3)



It consists of two SCRs T_1 and T_2 , inductor L and a transformer and capacitor C .

Transformer turns ratio from each 1^o half to 2^o wdg is assumed to be unity

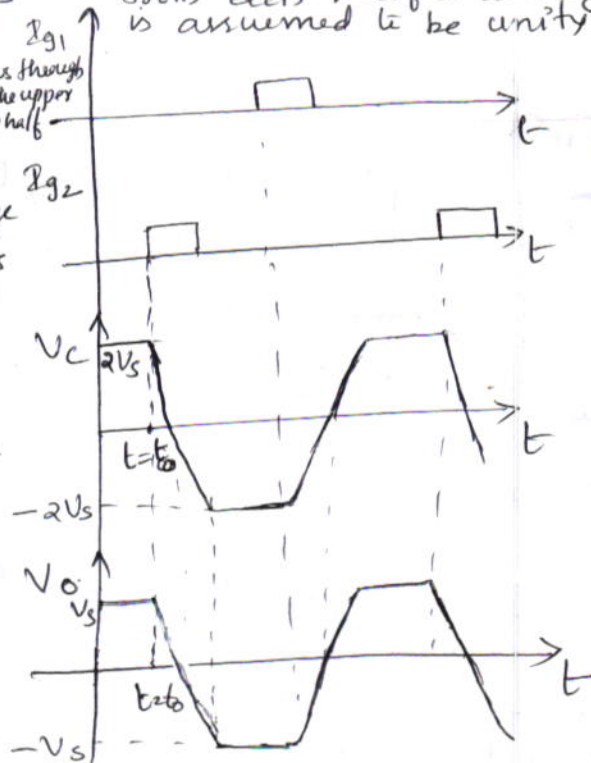
Fig: 2

Wave form 2

Exp 2

Mode-I - In this mode T_1 is conducting. V_s is induced in the both half of the 1^o wdg. This voltage charges the capacitor to $2V_s$. In this mode $V_o = V_s$, $V_c = 2V_s$ and $i_o = I_o$.

Mode-II At time $t = t_0$ T_2 is triggered. At the same time T_1 is reverse biased by the capacitor voltage and it is turned off.

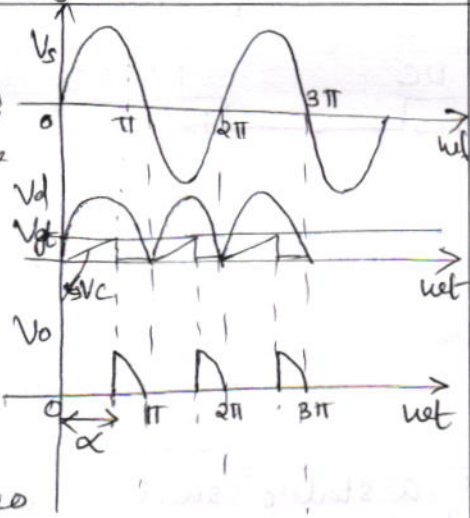
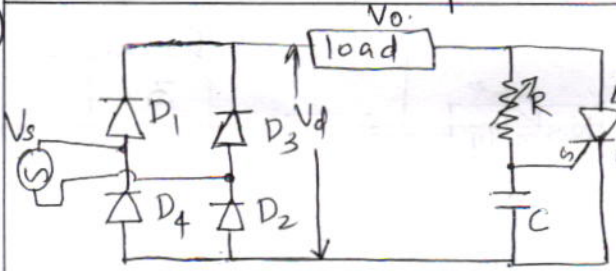


6

The current flows through the lower half capacitor current flows till the capacitor has charged from $+2V_s$ to $-2V_s$ load voltage is also changes from V_s to $-V_s$

Mode III! When the capacitor is charged to $-2V_s$ with upper plate $-ve$, SCR T_1 may be turned on at any time. If the SCR T_1 is triggered at t_2 the capacitor voltage reverse biases the SCR T_2 and it is turned off. The capacitor is now charged from $-2V_s$ to $2V_s$ and repeat the cycle.

II (4)

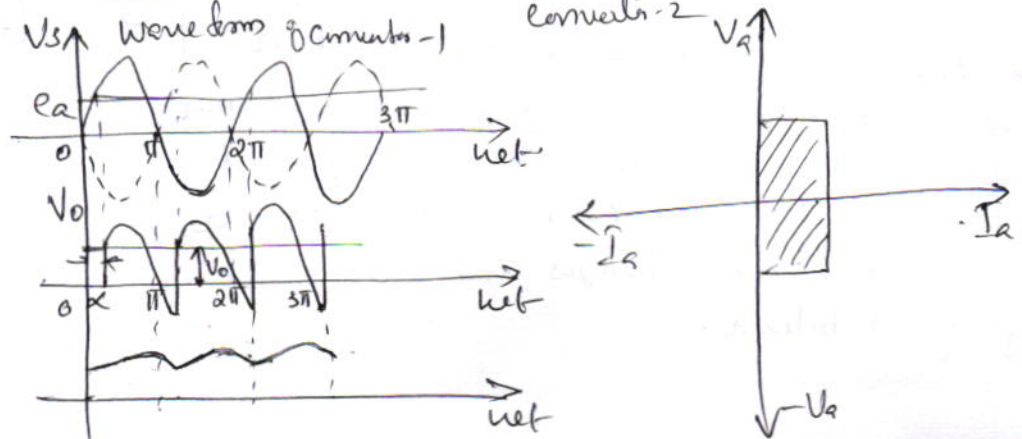
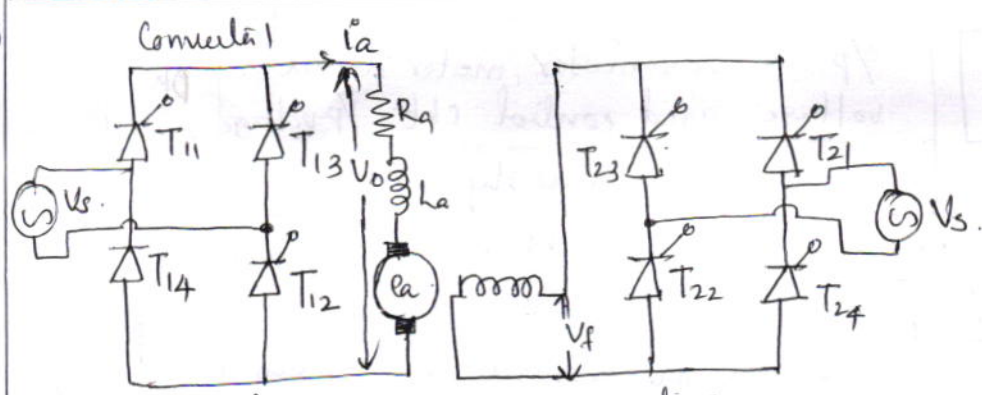


Diodes $D_1 - D_4$ forms a fullwave diode bridge. In this ckt the initial voltage from which the capacitor charges is almost zero. When capacitor charges to a voltage equal to V_{gt} SCR triggers and rectified voltage V_d appears across the load as V_o . The firing angle α can be varied from 0° to 180° .

Ckt 2
Wave form 2
Exp 2.

6.

II (5)



Ckt-3
Exp-3

In full converter dc drives two full converters one is connected in armature ckt and other is connected in field ckt. By adjusting the firing angle of converter-1 armature voltage can be varied, this gives the speed below base speed. By adjusting the firing angle of converter-2 the field current can be varied, this gives the speed above base speed. It is a two quadrant converter.

II(b)

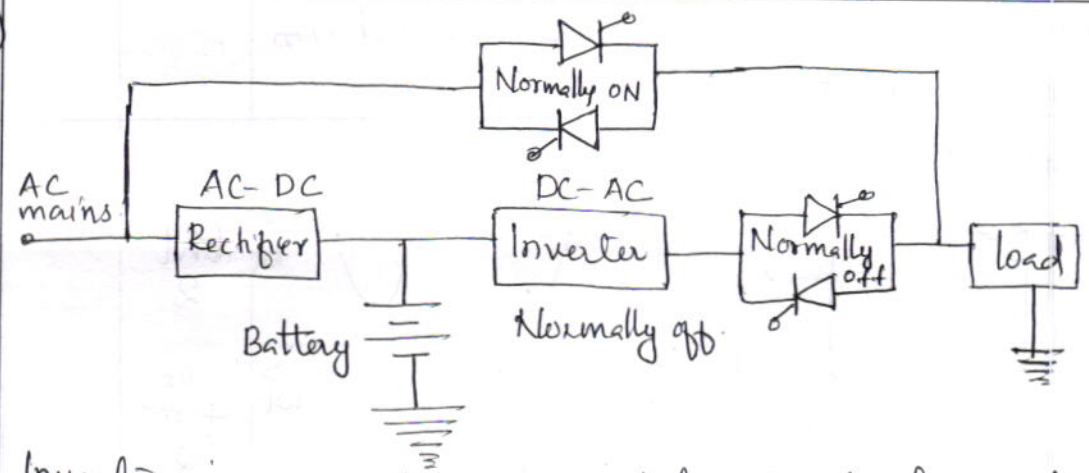


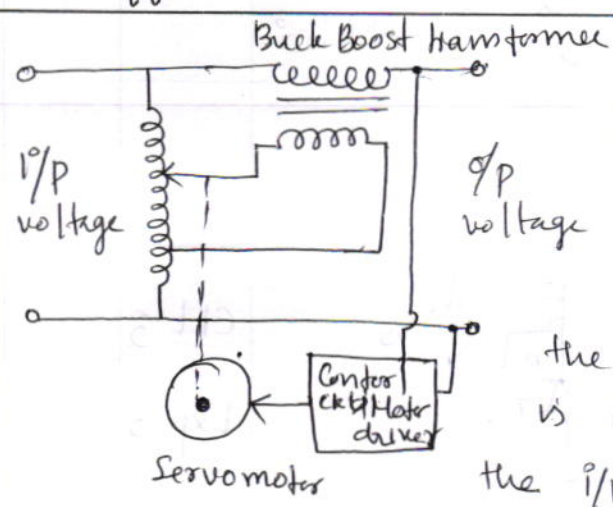
Diagram 3

Exp 3

6

Inverter is normally in off state. The load is fed from the mains supply. When the mains supply is not available, a static switch switches on the inverter and connects it to the load automatically. When supply is restored, the inverter is again shut off.

II(T)



It consists of buck boost transformer, auto transformer servomotor, motor driver. i/p voltage and control ckt. i/p voltage is continuously sensed by the control ckt whenever there is high or low voltage at the i/p, the control ckt gives

Fig: 3

Exp 3

6

a trigger to the motor driver. The motor driver moves the servomotor across the wdg of autotransformer so as to decrease or increase the no. of wdg and hence the voltage across 1^o of buck boost transformer. Then the voltage across 2^o also changes and that gives the o/p voltage of stabilizer.