

MODEL TEST PAPER

TIME: 60 Minutes Max Marks: 10

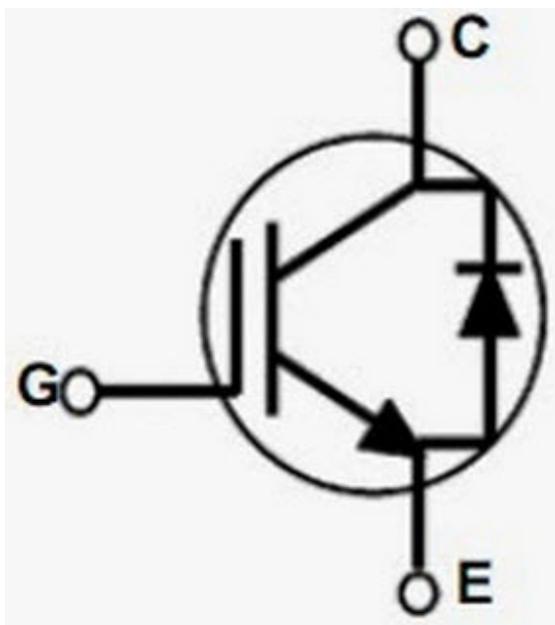
Q:1 Draw the basic structure of IGBT and explain its working

2

The IGBT (insulated gate bipolar transistor) is a three-terminal electronic components, and these terminals are termed as emitter, collector and gate. Two of its terminals namely collector and emitter are associated with a conductance path and the remaining terminal 'G' is associated with its control. The sum of amplification is achieved by the IGBT is a ratio between its input and output signal. For a conventional BJT, the amount of gain is almost equal to the ratio of the o/p current to the i/p current that is called a beta.

For a MOSFET (metal oxide semiconductor field effect transistor), there is no i/p current as the gate terminal is isolated from the main current-carrying channel. Thus, the gain of the field effect transistor equals to the an FET's gain is equal to the ratio of o/p current change to i/p v change, Then the IGBT can be treated as a power BJT and the base current of this transistor is provided by an MOSFET. The IGBT is mainly used in small-signal amplifier circuits like BJT or MOSFET When the transistor combines the lower conduction loss of a BJT and MOSFET, then an ideal solid state switch occurs which is perfect for in various applications of power electronics.

An IGBT is simply switched "ON" and "OFF" by triggering and disabling its Gate terminal. A constant +Ve voltage i/p signal across the 'G' and the 'E' will retain the device in its "ON" state, while deduction of the i/p signal will cause it to turn "OFF" like BJT or MOSFET.



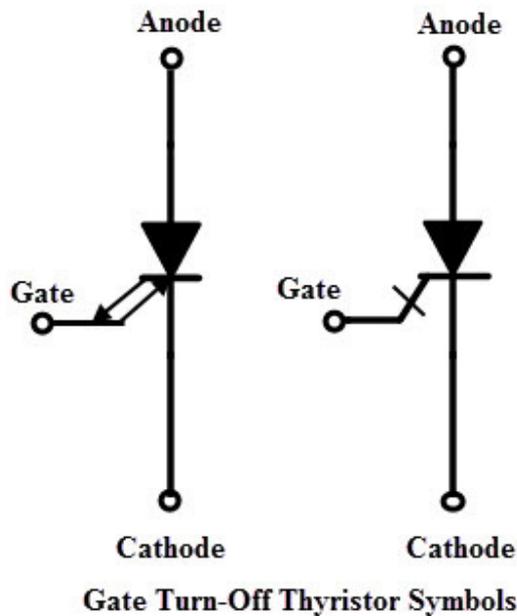
Q:2 Give the working principle of GTO

2

A Gate Turn off Thyristor or GTO is a three terminal, bipolar (current controlled minority carrier) semiconductor switching device. Similar to conventional thyristor, the terminals are anode, cathode and gate as shown in figure below. As the name

indicates, it has gate turn off capability.

These are capable not only to turn ON the main current with a gate drive circuit, but also to turn it OFF. A small positive gate current triggers the GTO into conduction mode and also by a negative pulse on the gate, it is capable of being turned off. Observe in below figure that the gate has double arrows on it which distinguish the GTO from normal thyristor. This indicates the bidirectional current flow through the gate terminal.



Q:3 Compare power MOSFET with BJT(atleast five point)

2

	BJT	MOSFET
1	It is a Bipolar Device	It is majority carrier Device
2	Current control Device	Voltage control Device.
3	Output is controlled by controlling base current	Output is controlled by controlling gate voltage
4	Negative temperature coefficient	Positive temperature coefficient
5	So paralleling of BJT is difficult.	So paralleling of this device is easy.