Diplete – ET (NEW SCHEME) - Code: DE71

Subject: POWER ELECTRONICS

Time: 3 Hours

JUNE 2011

Max. Marks: 100

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

0.1 Choose the correct or the best alternative in the following: (2×10) a. The is a commonly used device in power electronics. (A) PIN Diode (B) UJT (C) PV Cell **(D)** SCR. b. A power MOSFET is a _____ controlled device. (A) Current (**B**) Frequency (D) Voltage. (C) Power factor c. An inverter is: (A) AC to DC converter (B) AC to AC converter (C) DC to DC converter (D) DC to AC converter. d. The DIAC is primarily used as: (A) Power thyristor **(B)** Triggering device (C) Pulse generator (D) Surge protector e. The static switches are of the following types: (A) Only the AC switches (B) Only the DC switches (C) The electro-mechanical AC and DC switches (D) AC and DC switches for low and high power applications. f. The gating signals for thyristors of AC-DC converters requires: (A) Pulse shaping to generate short duration pulses (B) Detecting zero crossing of the input voltage. (C) Phase shifting of signals **(D)** All of the above. g. Optocouplers are: (A) Pulse transformers (B) AC voltage converters (C) Fast switching thyristors (D) Commutation capacitors. DE71 / JUNE - 2011 1 **DipIETE - ET (NEW SCHEME)**

h. The choppers are commonly used as:

(A) DC transformers(C) Harmonics generators

- (**B**) Voltage regulators
- (D) Frequency controllers.
- i. The commonly used device for protection against transient over voltages is:
 - (A) Schottky diode (B) Selenium diode
 - (C) Bipolar junction transistor (D) Heat sink.
- j. For series and parallel operation of thyristors, the preferred approach is to:
 - (A) Use a common heat sink
 - (B) Connect a small resistance in series with each thyristor
 - (C) Use magnetically coupled inductors
 - (D) Provide voltage and current sharing networks to protect them under steadystate and transient conditions.

Answer any FIVE Questions out of EIGHT Questions. Each question carries 16 marks.

Q.2	a.	With the help of circuit diagrams explain gate turn-off and gate turn-on of a thyristor. (4+4)		
	b.	Discuss the methods of thyristor protection. (8)		
Q.3	a.	What is the role of UJT and MOSFETs in triggering mechanism of power controlled circuits? (8)		
	b.	Explain the commonly used cooling arrangements for high power devices What are the merits and demerits of water and air cooled systems? (8)		
Q.4		Write notes on the following:		
		(i) Light Activated SCR,(ii) Thyristor Commutation.		
		Give diagrams, schematics and operational characteristics. (8+8)		
Q.5	a.	Compare the working of full wave controlled centre tap rectifier with full wave controlled bridge rectifier with the help of circuit explanation. (8)		
	b.	Why is the power factor of semi-converters better than that of full-converters? (8)		
Q.6	a.	With the help of diagram, explain the working principle of Full-wave Half controlled Bridge Rectifiers with FWD. (8)		
	b.	Using block/schematic diagram explain working of a half-wave three pulse controlled rectifier. (8)		

Q.7 With the help of diagram / circuit explain the working of following:-

(i)	Buck-Boost chopper.		
(ii)	Step down chopper.	(8+	-8)

- Q.8 a. What is the principle of operation of an inverter? Give its performance parameters? (6+4)
 - b. What are the advantages and disadvantages of current-source inverters? (6)
- **Q.9** 'Static and mechanical switches, Cycloconverters and Controlled rectifiers are used in Power Electronics' --- justify this statement by giving examples, their operating characteristics and their typical utility in industrial applications.

(6+10)