

AMIETE – ET (OLD SCHEME)

Code: AE26

Subject: POWER ELECTRONICS

Time: 3 Hours

JUNE 2009

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.
- 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.

Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. GTO can be turned off by
- (A) Applying a negative gate signal.
 (B) Applying a positive gate signal.
 (C) Reducing the current below holding current.
 (D) Both (A) and (C).
- b. DIACs are primarily used as
- (A) Power thyristors. (B) Triggering devices.
 (C) Surge protection devices. (D) Both (B) and (C).
- c. Latching current of thyristor is associated with:
- (A) Turn on process. (B) turn-off process.
 (C) Turn-on and turn off process. (D) None of these.
- d. A dual converter used for the speed control of dc motors, will have two bridges, they are
- (A) Two rectifiers. (B) Two inverters.
 (C) One rectifier and one inverter. (D) None of above.
- e. A free wheeling diode is used in a controlled rectifier circuit in case of
- (A) Resistive load. (B) Inductive load.
 (C) Capacitive load. (D) None of above.
- f. When energy is returned to the system by a motor, it is referred as
- (A) Plugging. (B) Dynamic braking.
 (C) Regenerative braking. (D) Reciprocating.
- g. If the duty cycle of a chopper circuit is exactly 50%, the pulse is considered to be a:
- (A) sine wave. (B) low duty cycle.
 (C) high duty cycle. (D) square wave.
- h. In a Single pulse width modulation technique the dominant harmonic is:

- (A) 3rd. (B) 5th.
 (C) 11th. (D) 2nd.

i. Three phase to three phase cycloconverter gives better output as compared to single phase to single phase cycloconverter.

- (A) True (B) False

j. The main difference between thyristor and PUT is that

- (A) The gate of PUT is connected in n-type material near cathode.
 (B) The gate of PUT is connected in n-type material near anode.
 (C) PUT has no gate.
 (D) PUT is used for firing of thyristor.

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

- Q.2** a. Explain the methods of turning on and turning off the thyristor. (8)
- b. Write short notes on:-
 (i) Cooling of thyristor.
 (ii) Power MOSFET. (8)
- Q.3** a. Explain Extinction angle control for the power factor improvement for three phase dual converter. (8)
- b. Discuss effect of impedance on
 (i) Single phase
 (ii) Three phase converter operation. (8)
- Q.4** a. Classify and compare different types of switched mode regulators. (10)
- b. A step up chopper has supply voltage of 250 V while the output voltage is 500 V. If the off period of chopper be 100 µsec, determine the pulse width of the output voltage. (6)
- Q.5** a. What is the difference between forced and natural commutation? Describe an impulse commutation circuit. (10)
- b. Discuss di/dt and dv/dt feature of a thyristor. (6)
- Q.6** a. List and draw the various configurations of three phase ac voltage regulators. (8)
- b. Discuss the operation of a single phase ac voltage controller for an inductive load. (8)
- Q.7** a. What are cycloconverters? Explain single phase to single phase cycloconverter with relevant diagrams. (8)
- b. Write short notes on:-
 (i) Reduction of harmonics in output.

(ii) Circulating current mode operation of cycloconverter. **(8)**

Q.8 a. State and explain different methods of voltage control in single phase inverters. **(8)**

b. A 3 phase bridge inverter is fed from a 400 V battery. The load is star connected and has a resistance of 10 ohms per phase. Find the rms load current, power output, peak current of thyristor. Assume 180° mode of operation. **(8)**

Q.9 a. Draw and explain in brief the circuits for single phase and three phase converter drives. **(8)**

b. A 230V, 1500 rpm separately excited dc motor has an armature resistance of 1Ω and rated armature current of 10 A. It is fed from 230 V single phase AC, 50 Hz through a fully controlled bridge converter. Compute speed if torque is 5 N-m and firing angle is 30° . **(8)**