DipIETE – ET (OLD SCHEME)

Code: DE22 **Subject: INDUSTRIAL ELECTRONICS**
Time: 3 Hours **Max. Marks: 100**

DECEMBER 2009

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 best alternative in the following: **(2 × 10)**

a. Latching current

(A) more than holding current
(B) is same as holding current
(C) less than holding current
(D) None

b. Which of the following is not used for turning on thyristor:

(A) dv/dt triggering
(B) di/dt triggering
(C) Gate triggering
(D) light triggering

c. Which of the following is true for full wave controlled rectifier (single phase)

(A) Two thyristors and two diodes **(B)** Two thyristors
(C) Two thyristors and one diode **(D)** None

d. In parallel inverter

(A) Capacitor C is not connected
(B) Capacitor C and load are in series
(C) Capacitor C and load are in parallel
(D) Capacitor C and load are effectively in parallel

e. Choppers are used as

(A) ac-dc converter **(B)** dc-ac converter
(C) dc-dc converter **(D)** None

f. In controlled heating circuits thyristors act as

(A) Chopper **(B)** Cyclo converter
(C) AC regulator **(D)** None of above

g. Jones chopper uses

(A) Line commutation **(B)** Auxilliary commutation
(C) Load commutation **(D)** None

h. Three phase bridge inverter requires

(A) Three thyristors and three diodes
(B) Six thyristors and six diodes
(C) Twelve thyristors and twelve diodes
(D) None of above

i. The operating frequency in dielectric heating is

(A) 100 kHz to 0.5 MHz **(B)** 0.5 MHz to 1 MHz
(C) 10 kHz to 100 kHz **(D)** 1 MHz to 40 MHz

j. Auxilliary commutated chopper circuit has

(A) 1 thyristor **(B)** 2 thyristors
(C) 4 thyristors **(D)** None of above

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

Q.2 a. Define any four voltage and current ratings of a thyristor. **(8)**

b. A dc supply of 100 V feeds an inductance of 10 H through a thyristor. Find the minimum width of the gate pulse so that the thyristor is triggered. The latching current of thyristor is 80 mA. **(8)**

Q.3 a. Draw the UJT relaxation oscillator triggering circuit for SCR and explain its operation. **(8)**

b. A single phase half wave rectifier circuit using a thyristor is fed by a transformer whose secondary voltage is 400 sin ωt. Find the average load voltage, rms load voltage, average load current and rms load current, if the thyristor is fired at 30°C in each positive half cycle. The load resistance is 50 Ω. **(8)**

Q.4 a. Draw the circuit diagram of single phase half wave converter with R load and without freewheeling diode and explain its operation. **(8)**

b. Draw the circuit diagram of a single phase half bridge inverter and explain its operation. **(8)**

Q.5 a. Explain the circuit of parallel inverter and also draw the waveforms of load voltage and load current. **(8)**

b. A dc chopper has input voltage of 200 V and output voltage of 150 V. Load resistance is 100 Ω. Find (a) duty cycle (b) average and rms load currents (c) rms thyristor currents (d) average input current (e) effective input resistance. **(8)**

Q.6 a. Explain the principle of operation of chopper. **(8)**

b. Discuss the operation of an auxiliary commuted chopper. Draw the circuits showing the different modes of operation. **(8)**

Q.7 a. What is Jones chopper? Describe its operation. **(8)**

b. Describe series operation of SCRs. **(8)**

Q.8 a. Describe the principle of operation of dielectric heating. **(8)**

b. An insulating slab has 100 cm^2 area and is 5 cm thick. It is to be heated by 300 W power at 10 MHz frequency. If relative permittivity is 4.5 and power factor is 0.05. Find applied voltage and current. **(8)**

Q.9 a. Compare induction heating and dielectric heating and also give a few uses of each. **(8)**

b. Describe the inverter configurations used for induction heating. **(8)**