Code: D-22 **Subject: INDUSTRIAL ELECTRONICS**
Time: 3 Hours **Max. Marks: 100**

NOTE: There are 11 Questions in all.

- **Question 1 is compulsory and carries 16 marks. Answer to Q. 1. must be written in the space provided for it in the answer book supplied and nowhere else.**
- **Answer any THREE Questions each from Part I and Part II. Each of these questions carries 14 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1 Choose the correct or best alternative in the following: (2x8)

a. Thyristor is a

(A) Three terminal, three layer device.
(B) Three terminal three junction four layer device.
(C) Simple diode in forward as well as reverse mode.
(D) Two junctions, three terminals, four-layer diode.

b. In R-firing circuit, the firing angle ranges from

(A) 0° to 180° **(B)** 0° to 360°
(C) 0° to 90° **(D)** 3° to 77°

c. In three phase full wave controlled rectifier

(A) Each thyristor conducts for 60°.
(B) Each thyristor conducts for 120°.
(C) Conduction angle of thyristor depends upon firing angle.
(D) Some thyristors conduct while others not.

d. In a series inverter

(A) The R, L and C elements form an under damped circuit
(B) The R, L and C elements have no role to play
(C) Power supply may be short circuited
(D) Highest frequency may be equal to resonant frequency.

e. For dielectric heating the supply requires

(A) Low frequency **(B)** Very low frequency
(C) High frequency **(D)** Very high frequency

f. In Jones chopper, the commutating elements are

(A) inductor and resistor.
(B) capacitor and inductor.
(C) capacitor and an auto-transformer.
(D) capacitor and a resistor.

g. A relaxation oscillator consists of

(A) a Tunnel diode **(B)** a UJT
(C) Both tunnel diode & UJT **(D)** a PIN diode

h. The two-transistor model of a thyristor consists of two transistors,

(A) One npn and other pnp **(B)** Both pnp
(C) Both npn **(D)** One npn and other UJT.

PART I
Answer any THREE Questions. Each question carries 14 marks.

Q.2 a. Explain the principle of operation of a thyristor and give its characteristics. **(8)**

b. Describe the resistance-triggering circuit for a thyristor. **(6)**

Q.3 Explain the different methods for turning-on a thyristor. **(14)**

Q.4 a. With the help of a circuit diagram and waveforms, describe the operation of a single-phase fully controlled bridge circuit. **(8)**

b. For a full wave controlled rectifier the firing angle is 60° and the, input voltage v = 100 sin 200t. Calculate the rms and average output voltages. **(6)**

Q.5 a. Explain the principle of operation of a single-phase cyloconverter; give some applications of the same. **(8)**

b. Give examples of natural and forced turn-off methods and explain their principles. **(6)**

Q.6 a. Explain the different classification of inverters. **(8)**

b. Give some applications of various types of inverters. **(6)**

PART II

Answer any THREE Questions. Each question carries 14 marks.

Q.7 a. Draw the wave forms of a three-phase half-controlled bridge rectifier. Explain its operation with a circuit diagram. **(8)**

b. Explain Jones chopper with a circuit diagram. **(6)**

Q.8 a. Give some applications of choppers. **(5)**

b. Explain the process of dielectric heating and give a few of its applications. **(9)**

Q.9 Explain load and auxiliary commutation circuits of choppers. **(14)**

Q.10 a. Explain thermal loss in dielectric heating. **(6)**

b. With the help of a circuit diagram, explain the principle of induction heating. **(8)**

Q.11 a. Explain the process of resistance welding and give some applications. **(7)**

b. Enumerate the advantages of induction heating and give some applications. **(7)**