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. When a Thyristor is conducting, the voltage drop across it
(A) is absolutely constant
(B) decreases with increase in load current
(C) increases slightly with increase in load current
(D) any of the above

b. An RC snubber circuit is used to protect a Thyristor against

(A) false triggering **(B)** failure to turn on
(C) switching transients **(D)** failure to commutate

c. A Triac is equivalent to
(A) two Thyristors in series **(B)** two Thyristors in parallel
(C) one Thyristor and one diode **(D)** one Thyristor and one transistor

d. The minimum gate current which can turn on an SCR is called

(A) latching current **(B)** holding current
(C) junction current **(D)** break over current

e. When a Thyristor is conducting, the voltage drop across it is about
(A) 1 V **(B)** 10 V
(C) 100 V **(D)** 0.1 V

f. In a Bridge inverter

(A) an output transformer is essential
(B) an output transformer is not essential
(C) an output transformer cannot be connected
(D) an output transformer if used, can improve the efficiency of the circuit

g. A Chopper

(A) converts constant voltage dc into ac and then into variable voltage dc
(B) converts constant voltage dc into variable voltage dc directly
(C) converts ac of one frequency into ac of another frequency

(D) converts ac to dc

h. A Cyclo converter uses

(A) natural commutation
(B) forced commutation
(C) either natural or forced commutation
(D) both natural and forced commutation together

PART I

Answer any THREE Questions. Each question carries 14 marks.

Q.2 a. With the help of Two transistor Model, discuss the operation of a SCR. Draw the V-I characteristics. Define latching current, holding current and break over voltage. **(9)**

b. What do you mean by SCR ratings? Discuss various voltage, current and gate ratings of SCR. **(5)**

Q.3 a. With the help of a circuit diagram and Waveform describe the operation of a UJT Relaxation Oscillator. **(7)**

b. Design a UJT Relaxation Oscillator for a frequency of 5 KHz given that the power supply is 15 V and the stand off ratio is 0.75. Assume any other parameters as required and state them. **(7)**

Q.4 a. With the help of a circuit diagram and Waveform, describe the operation of a half controlled bridge rectifier. **(8)**

b. A half controlled bridge rectifier is driven by a 220 V 50 HZ supply, the firing angle is 45°, the load is resistive and is of 50 Ω. Calculate the Average and RMS output voltages. Also find the average voltage across SCR. **(6)**

Q.5 a. Discuss the operation of a single phase Cyclo converter. Draw the wave forms for $\frac{1}{2}\ \frac{1}{3}\ \frac{1}{4}$ of the input frequency. **(8)**

b. Explain how the speed of a separately excited DC motor can be controlled by using control rectifier. **(6)**

Q.6 a. What is the significance of turn off time in thyristors? Discuss various turn off circuits used in inverters. **(7)**

b. Draw the circuit of parallel inverter and describe its operation. **(7)**

PART II

Answer any THREE Questions. Each question carries 14 marks.

Q.7 a. Draw the circuit of a 3 phase bridge inverter. Discuss the operation for 120° conduction angle with the help of a Waveform. **(7)**

b. Discuss the operation of series inverter with the help of a circuit diagram. What are its applications? **(7)**

Q.8 a. What is the Principle of operation of Chopper? How the Choppers are classified? **(6)**

b. Draw the circuit of Morgons Chopper and describe its operation? **(8)**

Q.9 a. Define the following terms:-
(i) dv/dt triggering (ii) temperature triggering
(iii) light triggering (iv) di/dt triggering **(8)**

b. Explain how an SCR can be protected against dv/dt and di/dt triggerings? **(6)**

Q.10 a. What is the Principle of Induction heating? Give a few applications of Induction heating. **(6)**

b. Draw a Battery charger circuit using SCR and describe its operation. **(8)**

Q.11 a. What is the principle of operation of Dielectric heating? Give a few of its applications. **(7)**

b. Write short notes on Resistance welding. **(7)**