Total No. of printed pages = 6

END SEMESTER EXAMINATION – 2022

Semester : 5th

Subject Code : ET-503

POWER ELECTRONICS

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instructions :

1. *All* questions of PART – A are compulsory.
2. Answer any *five* questions from PART – B.

PART – A

Marks – 25

1. Fill in the blanks : 1×10=10

   (a) An IGBT is a _____ controlled device.

   (b) A SCR is two _____ analogy.

   (c) _____ is used to trigger TRIAC.

   (d) GTO stands for _____.

[Turn over

(e) In a controlled rectifier when the load is _____ the output current and voltage are in phase.

(f) Inverter is a _____ to _____ converter.

(g) AC regulator is a circuit which converts _____ voltage to _____ voltage.

(h) A switching regulator uses _____.

(i) A _____ regulator is a circuit which increases the output voltage than the input voltage.

(j) SMPS have _____ number of configurations.

2. State whether the following statements are true or false : 1×10=10

(a) A TRIAC has three modes of operation.

(b) In a thyristor holding current is less than latching current.

(c) A snubber circuit uses a capacitor in series with thyristor.

(d) The use of freewheeling diode improves the wave shape of load current and input power factor.

(e) A three phase inverter can be operated in 120 degree or 180 degree mode.

(f) The principle of SMPS is similar to that of chopper.

(g) IGBT combines the advantages of BJT and MOSFET.

(h) An AC regulator is an AC-DC converter.

(i) An UPS (Uninterrupted Power Supply) is invariably needed for critical loads.

(j) A stepper motor is also known as step motor or stepping motor.

3. Choose the correct answers : 1×5=5

(a) A TRIAC is equivalent to

(i) Two thyristor in series

(ii) Two thyristor in parallel

(iii) One thyristor and one diode

(iv) One thyristor and one transistor

(b) In a controlled rectifier a freewheeling diode is necessary when the load is

(i) Inductive (ii) Resistive

(iii) Capacitive (iv) All of these

(c) Power MOSFET finds the application in

(i) High power high frequency

(ii) Low power high frequency

(iii) Low power low frequency

(iv) High power low frequency

(d) The main elements of UPS are

(i) Rectifier

(ii) AVR

(iii) Inverter

(iv) All of the above

(e) Inverter finds applications in

(i) HVDC transmission

(ii) UPS

(iii) Variable speed AC drives

(iv) All of the above.

PART – B

Marks – 45

4. (a) What is a power diode ? 2

(b) Name some applications of power diode. 4

(c) Compare BJT and POWER MOSFET. 3

5. (a) What is a thyristor ? What is the function of gate in a thyristor ? 2

(b) Explain the construction and working of a thyristor. 4

(c) Draw the VI characteristics curve of thyristor and explain. 3

6. (a) What is a controlled rectifier ? 2

(b) Explain the working of a single phase fully controlled bridge rectifier feeding a purely resistive load. 5

(c) Draw the waveform of input voltage, firing pulses, output voltage and load current. 2

7. (a) What is an inverter ? 2

(b) Discuss the classification of inverter. 3

(c) Explain the working of a voltage driven inverter with circuit diagram. 4

8. (a) Draw the circuit of a series regulator and explain the functions of different components. 4

(b) Draw the circuit and explain the working of flyback converter. 5

9. (a) What is UPS ? How is it classified ? 5

(b) Explain the working of offline UPS with proper diagram. 4

10. What is a buck-boost regulator ? Draw its circuit and explain its working. 9

11. Name some applications of AC regulators. Draw the circuit diagram and explain the working of a solid state tap changing transformer. 9

12. What is a stepper motor ? Explain the different types of stepper motor. 9