Total No. of printed pages = 7

END SEMESTER EXAMINATION – 2021

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) A thyristor is a _____ layer PNPN semi-conductor device.

   (b) A _____ is a bi-directional thyristor.

[Turn over

(c) A DIAC is a _____ electrode PNPN device.

(d) An IGBT is a _____ controlled device.

(e) An IGBT has lower switching time than _____.

(f) The use of _____ diodes improves the wave shapes of the load current.

(g) An inverter is a _____ converter.

(h) An AC regulator converts a constant AC voltage into a _____ AC voltage.

(i) UPS stands for _____.

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

2. Write true or false : 1×10=10

(a) An SCR is a two transistor analogie.

(b) MOSFETS have very fast switching characteristics.

(c) An IGBT combines the advantages of BJT and MOSFET.

(d) Rectifier circuits using thyristors are known as uncontrolled rectifier.

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

(f) In a switching regulator the output voltage is always lower than input voltage.

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

(h) IC regulators are all series regulators.

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

(j) Power BJTs are used in power supplies and inverter circuits.

3. Choose the correct answer : 1×5=5

(a) Thyristor is a

(i) voltage controlled device

(ii) current controlled device

(iii) both voltage and current controlled device

(b) Freewheeling is useful when the load is

(i) Inductive

(ii) Capacitive

(iii) Resistive

(iv) None of the above

(c) In a buck regulator as the duty cycle increases

(i) the output voltage increases

(ii) the output voltage decreases

(iii) the output voltage increases at no load and decreases at full load

(iv) the output voltage decreases at load and increases at full load

(d) Inverter finds applications in

(i) HVDC transmission

(ii) UPS

(iii) Variable speed AC drives

(iv) All of the above

(e) To protect an SCR against high di/dt we connect

(i) a capacitance in series with SCR

(ii) a capacitance in parallel with SCR

(iii) an inductance in series with SCR

(iv) an inductance in parallel with SCR

PART – B

Marks – 45

4. (a) What is a thyristor ? 2

(b) Discuss its operation and characteristics. 5

(c) Draw the two transistor analogies of a thyristor. 2

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

(b) Name some applications of power diode. 4

(c) Give a comparison between power MOSFET and IGBT. 3

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

(b) Explain the working of a single-phase half wave controlled rectifier feeding a purely resistive load. 5

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

7. (a) What is an inverter ? 2

(b) What are the advantages of a current source inverter ? 3

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

8. (a) What is a DC regulated power supply ? 4

(b) Draw the circuit diagram of a shunt regulator and explain the functions of different components. 5

9. (a) What is UPS ? Classify UPS. 5

(b) Explain the working of ON-LINE UPS with a proper diagram. 4