

Total No. of printed pages = 6

END SEMESTER EXAMINATION, NOVEMBER-2018

Semester – 5th

Subject Code : Et-501

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 semiconductor device.

(b) A TRIAC is a _____ directional thyristor.

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(c) A thyristor can be turned on by _____ gate signal.

(d) A GTO stands for _____.

(e) An IGBT has _____ losses as well as low switching time.

(f) To improve the wave shape of load current and power factor, a diode known as _____ diode is used.

(g) An inverter is a _____ converter.

(h) SMPS is multistage _____ supply and is used for high rating.

(i) A _____ regulator gives an output voltage which is less than input voltage.

(j) Power BJTs are used in power supplies and _____ circuit.

2. Write true or false :

$1 \times 10^*$

(a) SCR is a uni-directional device.

(b) A TRIAC has two modes of operation.

(c) A CSI (Current Source Inverter) has simple commutation circuit.

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(2)

(d) A parallel inverter uses a transformer.

(e) A switching regulator uses PWM.

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

(g) A switching regulator can be buck, boost and buck-boost.

(h) In a series inverter the circuit is underdamped.

(i) A snubber circuit uses L and C in series.

(j) SMPS stands for Single Mode Power Supply.

3. Choose the correct answer :

$1 \times 5 = 5$

(a) The two-transistor model of a thyristor consists of two transistors

(i) One n-p-n and other p-n-p

(ii) Both p-n-p

(iii) Both n-p-n

(iv) One n-p-n and other UJT

24/I-i-501/PE

(3)

[Turn over

(b) The number of thyristors in a single phase fully controlled bridge rectifier is

- (i) 16
- (ii) 8
- (iii) 4
- (iv) 2

(c) Freewheeling diode is useful when the load is

- (i) Inductive
- (ii) Capacitive
- (iii) Resistive
- (iv) None of the above

(d) A single phase full bridge voltage source inverter operates with R load, the nature of o/p current is

- (i) Square wave
- (ii) Sine wave
- (iii) Triangular wave
- (iv) Pulse wave

(e) Thyristor is a

- (i) Bi-directional device
- (ii) Uni-directional device
- (iii) Bipolar device
- (iv) Unipolar device

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(4)

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PART - B
Marks - 45

4. (a) What is a SCR ?

2

(b) Explain the construction and working of SCR with a proper diagram.

5

(c) Draw the V-I characteristics of SCR.

2

5. (a) Name any four members of a thyristor family.

4

(b) Draw the symbols of SCR, Diac, Triac and IGBT.

2

(c) Explain the two transistor analogy of a thyristor.

3

6. (a) What is a controlled rectifier ?

2

(b) Draw the circuit diagram of a single phase half wave controlled rectifier feeding a resistive load and explain its working in brief.

5

(c) Draw the waveform diagram of input voltage, output voltage, output current and gate current.

2

24/Et-501/PE

(5)

[Turn over

7. (a) What is an inverter ? 2
- (b) Discuss the classification of inverter. 3
- (c) Draw a neat circuit diagram of voltage driven inverter and explain its working. 4
8. (a) What is SMPS ? Name some commonly used configuration of SMPS. 5
- (b) Draw the circuit diagram of a flyback converter. 4
9. (a) What is UPS ? Classify UPS. 5
- (b) Explain the working of ON-LINE UPS in brief with a proper diagram. 4
10. What is an AC regulator ? Give some of its applications. 9
11. State and explain the various methods of speed of control of DC motor. 9
12. Explain the protection of thyristor with the help of snubber circuit. 9