G 475 (Pages : 3) Reg. No.....

Name.....

# B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, APRIL 2010

## Second Semester

B.Sc. Physics (Vocational—Model-II)

Vocational Subject — Applied Electronics

POWER ELECTRONICS

Time : Three Hours Maximum Weight : 25

## Part A (Objective Type Questions)

*Weight 1 each for each bunch.*

### Bunch 1

*Choose the most appropriate.*

1. The minimum gate current which can turn ON an SCR is called :
   (a) Trigger current. (b) Holding current.
   (c) Junction current. (d) Breakover current.
2. The rated current of a thyristor is 40A. The holding current will be about :
   (a) 20 A. (b) 1 A.
   (c) 100 mA. (d) 10 mA.
3. The main utility of SCR is due to :
   (a) Gate triggering. (b) High temperature triggering.
   (c) $\frac{dv}{dt}$ triggering. (d) High breakdown voltage.
4. A silicon controlled switch has :
   (a) 2 leads. (b) 3 leads.
   (c) 4 leads. (d) 5 leads.

### Bunch 2

*Choose the most appropriate.*

5. The gate terminal in a thyristor is welded to :
   (a) Player to which anode is connected.
   (b) $n$ layer nearest to the anode terminal.
   (c) $p$ layer nearest to the cathode terminal.
   (d) outside $n$ layer.

Turn over

6. When a thyristor is conducting, the voltage drop across it is about :

(a) 1 V. (b) 0.1 V.

(c) 10 V. (d) 100 V.

7. A thyristor is reverse biased. A positive gate pulse is applied. The thyristor :

(a) will be turned ON. (b) may or may not turn ON.

(c) will not turn ON. (d) will turn ON after some time.

8. The number if doped regions in an SCR is :

(a) 2. (b) 3.

(c) 4. (d) 5.

**Bunch 3**

*Choose the most appropriate.*

9. A voltage $V_{BB}$ is applied across the base terminals of a UJT. The emitter voltage at peak point is :

(a) $\eta V_{BB}$. (b) $(\eta + 1) V_{BB}$.

(c) $\eta V_{BB} + V\gamma$. (d) $V\gamma$.

10. Which of the following devices is used in relaxation oscillator ?

(a) SCR. (b) DIAC.

(c) TRIAC. (d) UJT.

11. Between which points does UJT exhibit negative resistance characteristics ?

(a) before peak point. (b) after peak point.

(c) after valley point. (d) between peak and valley points.

12. An SUS is :

(a) Similar to UJT.

(b) exactly similar to SCR but with higher rating.

(c) Programmable Unijunction transistor and avalanche diode connected in parallel.

(d) SCR and avalanche diode connected in parallel.

**Bunch 4**

*Fill in the blanks.*

13. The oscillator using UJT is called ———.

14. To turn off an SCR its anode-cathode current must be reduced to a value less than ———.

15. If the input voltage to a single-phase half wave controlled rectifier is $V_m \sin \omega t$, the peak inverse voltage is ———.

16. Thyristors connected in ——— need static and dynamic stabilizing circuits.

$(4 \times 1 = 4)$

## Part B (Short Answer Questions)

*Answer any* **five** *questions.*
*Each question carries a weight of* 1.

17. Define turn-on time of SCR.
18. What are the differences between holding and latching currents of a thyristor ?
19. How the turn off of the SCR takes place in controlled rectifiers ?
20. Explain what is the surge current rating of SCR.
21. What is negative resistance in UJT ? How it is caused ?
22. What is an inverter ? How they are classified ?
23. What is a silicon controlled switch ? List its applications.
24. What is meant by false triggering of SCR ?

$(5 \times 1 = 5)$

## Part C (Short Essay/Problems)

*Answer any* **four** *questions.*
*Each question carries a weight of* 2.

25. Draw the circuit of a single-phase semiconverter with RL load and explain the working with neat diagrams.
26. For a single-phase unidirectional ac voltage controller with resistive load of 10 Ω and input voltage 120 V, 60 Hz, the delay angle of the thyristor is $\alpha = \pi/2$. Calculate the average input current.
27. Explain with a neat circuit diagram and waveforms the working of a single-phase full wave fully controlled converter.
28. Draw and explain the working of UJT firing circuit for half-wave controlled rectifier.
29. With the help of two-transistor analogy model of SCR, derive an expression for the anode current.
30. The latching current for a SCR inserted in between a dc voltage source of 100 volt and a load, is 25 mA. Compute the minimum width of gate pulse current required to turn ON this SCR if the load consists of R = 20 Ω in series with L = 0.2H.

$(4 \times 2 = 8)$

## Part D (Essay questions)

*Answer any* **two** *questions.*
*Each question carries a weight of* 4.

31. With neat constructional diagram, explain the working of UJT. Sketch its emitter characteristics and equivalent circuit and explain the negative resistance.
32. Draw the output voltage, current and source current waveform for a single-phase, half-controlled converter and derive the expression for average output voltage. Describe the working of the circuit assuming the load to be inductive.
33. With the help of a neat circuit diagram, explain the operation of parallel inverter. Sketch the load voltage, load current and conduction interval for various devices for inductive load.

$(2 \times 4 = 8)$