



**INDUSTRIAL ELECTRONICS**  
**TWO MARKS**  
**UNIT-II PHASE-CONTROLLED CONVERTERS**

**1. What is the function of freewheeling diodes in controlled rectifier?**

It serves two processes.

- It prevents the output voltage from becoming negative.
- The load current is transferred from the main thyristors to the freewheeling diode, thereby allowing all of its thyristors to regain their blocking states.

**2. What are the advantages of freewheeling diodes in a controlled in a controlled rectifier?**

- Input power factor is improved.
- Load current waveform is improved and thus the load performance is better.

**3. What is meant by delay angle?**

The delay angle is defined as the angle between the zero crossing of the input voltage and the instant the thyristors is fired.

**4. What are the advantages of single-phase bridge converter over single phase midpoint converter?**

- SCRs are subjected to a peak-inverse voltage of  $2V_m$  in a fully controlled bridge rectifier. Hence for same voltage and current ratings of SCRs, power handled by mid-point configuration is about
- In mid-point converter, each secondary winding should be able to supply the load power. As such, the transformer rating in mid-point converter is double the load rating.

**5. What is commutation angle or overlap angle?**

The commutation period when outgoing and incoming thyristors are conducting is known as overlap period. The angular period, when both devices share conduction is known as the commutation angle or overlap angle.

**6. What are the different methods of firing circuits for line commutated converter?**

- UJT firing circuit.
- The cosine wave crossing pulse timing control.
- Digital firing schemes.

**7. Give an expression for average voltage of single-phase semi converters.**

Average output voltage  $V_{dc} = (V_m / \pi) (1 + \cos \alpha)$ .

### **8. What is meant by input power factor in controlled rectifier?**

The input power factor is defined as the ratio of the total mean input power to the total RMS input volt-amperes.

$PF = (V_1 I_1 \cos \phi_1) / (V_{rms} I_{rms})$  where  $V_1$  = phase voltage,  $I_1$  = fundamental component of the supply current,  $\phi_1$  = input displacement angle,  $I_{rms}$  = supply rms current.

### **9. What are the advantages of six pulse converter?**

- a. Commutation is made simple.
- b. Distortion on the ac side is reduced due to the reduction in lower order harmonics.
- c. Inductance reduced in series is considerably reduced.

### **10. What is meant by commutation?**

It is the process of changing the direction of current flow in a particular path of the circuit. This process is used in thyristors for turning it off.

### **11. What are the types of commutation?**

- a. Natural commutation
- b. Forced commutation

### **12. What is meant by natural commutation?**

Here the current flowing through the thyristor goes through a natural zero and enable the thyristor to turn off.

### **13. What is meant by forced commutation?**

In this commutation, the current flowing through the thyristor is forced to become zero by external circuitry.

### **14. What is meant by dc chopper?**

A dc chopper is a high-speed static switch used to obtain variable dc voltage from a constant dc voltage.

### **15. What are the applications of dc chopper?**

- a. Battery operated vehicles
- b. Traction motor control in electric traction
- c. Trolley cars
- d. Marine hoists
- e. Mine haulers
- f. Electric braking.

### **16. What are the applications of dc chopper?**

Chopper provides

- a. High efficiency
- b. Smooth acceleration
- c. Fast dynamic response
- d. Regeneration

**17. What is meant by step-up and step-down chopper?**

In a step- down chopper or Buck converter, the average output voltage is less than the input voltage. In a step- up chopper or Boost converter, the average output voltage is more than the input voltage.

**18. Write down the expression for average output voltage for step down chopper.**

Average output voltage for step down chopper  $V_0 = \delta V_s$ ,  $\delta$  is the duty cycle

**19. Write down the expression for average output voltage for step up chopper.**

Average output voltage for step up chopper  $V_0 = \frac{V_s}{1 - \delta}$ ,  $\delta$  is the duty cycle

**20. What is meant by duty-cycle?**

Duty cycle is defined as the ratio of the on time of the chopper to the total time period of the chopper. It is denoted by  $\delta$ .

**21. Give the applications of phase-controlled rectifier?**

Phase controlled rectifier applications include paper mills, textile mills using DC motor drives and DC motor control in steel mills.

**22. List the effect of source inductance on three phase-controlled rectifiers?**

The source impedance is taken as purely inductive. It causes the outgoing and incoming SCRs to conduct together. During the commutation period, the output voltage is equal to the average value of the conducting phase voltages.