

UNIT - IV - INVERTERS

1. **What is meant by inverter?**

A device that converts dc power into ac power at desired output voltage and frequency is called an inverter.

2. **What are the applications of an inverter?**

- rrr. Adjustable speed drives
- sss. Induction heating
- ttt. Stand-by aircraft power supplies
- uuu. UPS
- vvv. HVDC transmission

3. **What are the main classification of inverter?**

- www. Voltage Source Inverter
- xxx. Current Source Inverter

4. **Why thyristors are not preferred for inverters?**

Thyristors require extra commutation circuits for turn off which results in decreased complexity of the circuit. For these reasons thyristors are not preferred for inverters.

5. **How output frequency is varied in case of a thyristor?**

The output frequency is varied by varying the turn off time of the thyristors in the inverter circuit, i.e. the delay angle of the thyristors is varied.

6. **Give two advantages of CSI.**

- yyy. CSI does not require any feedback diodes.
- zzz. Commutation circuit is simple as it involves only thyristors.

7. **What is the main drawback of a single phase half bridge inverter?**

It require a 3-wire dc supply.

8. **Why diodes should be connected in antiparallel with the thyristors in inverter circuits?**

For RL loads, load current will not be in phase with load voltage and the diodes connected in antiparallel will allow the current to flow when the main thyristors are turned off. These diodes are called feedback diodes.

9. **What types of inverters require feedback diodes?**

VSI with RL load.

10. **What is meant a series inverter?**

An inverter in which the commutating elements are connected in series with the load is called a series inverter.

11. **What is the condition to be satisfied in the selection of L and C in a series inverter?** $\frac{R^2}{C} < 4L$

12. **What is meant a parallel inverter?**

An inverter in which the commutating elements are connected in parallel with the load is called a parallel inverter.

13. **What are the applications of a series inverter?**

The thyristorised series inverter produces an approximately sinusoidal waveform at a high output frequency, ranging from 200 Hz to 100kHz. It is commonly used for fixed output applications such as

- aaaa. Ultrasonic generator.
- bbbb. Induction heating.
- cccc. Sonar Transmitter
- dddd. Fluorescent lighting.

14. **How is the inverter circuit classified based on commutation circuitry?**

- eeee. Line commutated inverters.
- ffff. Load commutated inverters.
- gggg. Self commutated inverters.
- hhhh. Forced commutated inverters.

15. **What is meant by McMurray inverter?**

It is an impulse-commutated inverter, which relies on LC circuit and an auxiliary thyristor for commutation in the load circuit.

16. **What are the applications of a CSI?**

- iiii. Induction heating
- jjjj. Lagging VAR compensation
- kkkk. Speed control of ac motors
- llll. Synchronous motor starting.

17. **What is meant by PWM control?**

In this method, a fixed dc input voltage is given to the inverter and a controlled ac output voltage is obtained by adjusting the on and off periods of the inverter components. This is the most popular method of controlling the output voltage and this method is termed as PWM control.

18. **What are the advantages of PWM control?**

mmmm. The output voltage can be obtained without any additional components.

nnnn. Lower order harmonics can be eliminated or minimized along with its output voltage control. As the higher order harmonics can be filtered easily, the filtering requirements are minimized.

19. What are the disadvantages of the harmonics present in the inverter system?

- oooo. Harmonic currents will lead to excessive heating in the induction motors. This will reduce the load carrying capacity of the motor.
- pppp. If the control and the regulating circuits are not properly shielded, harmonics from power ride can affect their operation and malfunctioning can result.
- qqqq. Harmonic currents cause losses in the ac system and can even some time produce resonance in the system. Under resonant conditions, the instrumentation and metering can be affected.
- rrrr. On critical loads, torque pulsation produced by the harmonic current can be useful.

20. What are the methods of reduction of harmonic content?

- ssss. Transformer connections
- tttt. Sinusoidal PWM
- uuuu. Multiple commutation in each cycle
- vvvv. Stepped wave inverters

21. Compare CSI and VSI.

S. No.	VSI	CSI
1.	Input voltage is maintained constant	Input current is constant but adjustable
2.	The output voltage does not depend on the load	The output current does not depend on the load
3.	The magnitude of the output current and its waveform depends on the nature of the load impedance	The magnitude of the output voltage and its waveform depends on the nature of the load impedance
4.	It requires feedback diodes	It does not requires feedback diodes
5.	Commutation circuit is complicated i.e. it contains capacitors and inductors.	Commutation circuit is simple i.e. it contains only capacitors.

22. What are the disadvantages of PWM control?

SCRs are expensive as they must possess low turn-on and turn-off times.

23. What is meant by cyclo-converter?

It converts input power at one frequency to output power at

16 MARK QUESTIONS:

1. Draw the circuitry for a static circuit breaker and discuss its advantages and disadvantages.
2. What is the necessity for the UPS? Draw a block diagram for UPS and explain its operation.
3. Discuss the operation of the HVDC system and explain how the power flow can easily be controlled in both the directions. Also elaborate on its merits
4. What is an SMPS? What are its advantages? Draw the circuit arrangement for SMPS and explain briefly its operation.
5. Give a short note on the Monopolar HVDC system.
6. State the advantages of HVDC over conventional ac transmission system. Draw the schematic diagram of dc bipolar transmission system and explain it briefly.
7. What are resonant converters? Give their advantages over PWM controlled converters.
8. Describe M-type ZCS resonant converter with relevant circuits and waveforms. Explain and draw the circuit diagram of shunt and series static var compensators? What are the advantages and disadvantages of static var compensators?