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Question Bank

Subject Code :79716 Subject Name : Electronics Paper XII, Power Electronics Devices and Applications

Common subject Code (if any) _____

Q. 1 Select correct alternatives.

- 1. Conductivity modulation is a process where holes and electrons both are injected into the ---- ----- layer.**
A) emitter
B) base
C) drift
D) collector
- 2. The process of conductivity modulation result in the reduction in -----.**
A) voltage
B) On state losses
C) current
D) voltage and current
- 3. The operation of power ----- is basically dependant on the principle of creation of inversion layer.**
A) BJT
B) UJT
C) Diode
D) MOSFET
- 4. The power ----- is a current controlled device**
A) MOSFET
B) BJT
C) SCR
D) UJT
- 5. Which of the following device has the terminals collector, emitter ,gate**
A) BJT
B) SCR
C) IGBT
D) MOSFET
- 6. A power diode uses the vertically oriented structure as it reduces on state
.....**
A) voltage drop
B) switching frequency
C) output current
D) none of these

7. **The reverse recovery current in power diode depends upon**
A) storage charge B) temperature
C) Forward current D) PIV
8. **The power MOSFET is a controlled device..**
A) current B) voltage C) power
D) none of these
9. **..... is a unidirectional device with three terminals.**
A) Triac B) Diac
C) SCR D) none of these
10. **----- structure is obtained by adding an insulated gate to the power transistor and pt layer.**
A) BJT B) IGBT
C) SCR D) MOSFET
11. **If the firing angle of SCR is ----- degree, then its conduction angle 120 degree**
A) 150 B) 90
C) 120 D) 60
12. **The forward breakover voltage of SCR is decreased by increasing**
A) anode current B) anode voltage
C) gate current D) none of these
13. **----- is a bidirectional device with three terminals.**
A) SCR B) Triac
C) Diode D) none of these
14. **The ----- current is generated due to thermally generated electron-hole pairs.**
A) leakage B) forward
C) reverse D) none of these
15. **The latching current is holding current.**
A) less than B) equal to
C) greater than D) none of these
16. **The rating of an SCR is specified for its rising anode current.**

- A) $L \, di/dt$ B) dv/dt
C) di/dt D) None of these

17. is an equivalent to two thyristor in antiparallel.

- A) SCR B) Triac
C) Diac D) BJT

18. For uncontrolled rectification ----- is used.

- A) Diode B) BJT
C) UJT D) IGBT

19. The phase voltage are phase shifted from each other by ----- degree

- A) 90 B) 120
C) 150 D) 180

20. The ----- voltage of an uncontrolled rectifier is always fixed and positive

- A) output B) input
C) input or output D) none of these

21. The voltage measured between any two phases is called as ---- voltage.

- A) Phase B) line
B) Line and phase D) none of these

22. ----- is a bidirectional device with three terminals.

- B) SCR B) Triac
C) Diode D) none of these

23. An inductance is connected in series with the ----- to protect it against damage due to high di/dt

- A) BJT B) Diode
C) SCR D) none of these

24. Power MOSFET is a ----- carrier device

- A) majority B) minority
C) both A & B D) none of these

25. The width of the ----- layer is always compromise between on state losses and breakdown voltage.

- A) emitter
- B) base
- C) collector
- D) drift

26. A silicon controlled rectifier (SCR) is a_____.

- a) Uni-junction device
- b) Device with three junction
- c) Device with four junction
- d) None of the above

27. A thyristor is basically_____.

- a) PNPN device
- b) A combination of diac and triac
- c) A set of SCRs
- d) A set of SCR, diac and a triac

28. Which semiconductor power device out of the following is not a current triggering device?

- a) Thyristor
- b) Triac
- c) G.T.O
- d) MOSFET

29. Power diodes are used in_____.

- a) Rectifier
- b) Mixer
- c) Amplifier
- d) None of these

30. The MOSFET combines the areas of _____ & _____

- a) Field effect & MOS technology
- b) semiconductor & TTL
- c) MOS technology & CMOS technology
- d) none of the mentioned

31. Which of the following terminals does not belong to the MOSFET?

- a) Drain
- b) Gate
- c) Base
- d) Source

32. Choose the correct statement

- a) MOSFET is an uncontrolled device
- b) MOSFET is a voltage controlled device
- c) MOSFET is a current controlled device
- d) MOSFET is a temperature controlled device

33. A power transistor is a _____

- a) three layer, three junction device
- b) three layer, two junction device
- c) two layer, one junction device
- d) four layer, three junction device

34. Insulated-gate bipolar transistor (IGBT) has combinational advantages of _____.

- a) BJTs and SITs
- b) BJTs and MOSFETs
- c) SITs and MOSFETs
- d) FETs and BJTs

35. In the internal structure of a MOSFET, a parasitic BJT exists between the _____.

- a) source & gate terminals
- b) source & drain terminals
- c) drain & gate terminals
- d) there is no parasitic BJT in MOSFET

36. Which of the following devices does not belong to the transistor family?

- a) IGBT
- b) MOSFET
- c) GTO
- d) BJT

37. The forward current gain α is given by _____.

- a) I_C/I_B
- b) I_C/I_E
- c) I_E/I_C
- d) I_E/I_B

38. The holding current is _____.

- a) Less than latching current.
- b) Higher than latching current.
- c) Equal to latching current.
- d) None of these.

39. Conductivity modulation takes place in case of _____

- a) SCR
- b) Diac
- c) Triac
- d) Power diode

40. For a single phase half wave rectifier, with R load, the diode is reversed biased from $\omega t =$ _____.

- a) 0 to π , 2π to $2\pi/3$
- b) π to 2π , $2\pi/3$ to 3π
- c) π to 2π , 2π to $2\pi/3$
- d) 0 to π , π to 2π

41. In a single phase HW diode rectifier with R load, the average value of load current is given by

- a) V_m/R
- b) $V_m/2R$
- c) $V_m/\pi R$
- d) Zero

42. The holding current I_H is _____.

- a) Important at the time of turn on
- b) Important while turning off the SCR
- c) The maximum permissible value of anode current
- d) None of the above

43. In silicon controlled rectifier, the load is connected _____.
- a) In series with anode
 - b) Across anode
 - c) In series with cathode
 - d) Across cathode
44. If the firing angle in case of SCR circuit is increased then output _____.
- a) Remains constant
 - b) Decreases
 - c) Increases
 - d) None of the above
45. The advantage of using freewheeling diode in half controlled bridge converter is that _____.
- a) There is always a path for the DC current independent of the AC line
 - b) There is always a path for the AC current independent of the ac line
 - c) There is always a path for the DC current dependent of the ac line
 - d) There is always a path for the AC current independent of the ac line
46. An inductance is connected in series with SCR to protect it against _____.
- a) Damage due to high dv/dt
 - b) Damage due to high di/dt
 - c) Damage due to large forward current
 - d) None of the above
47. The turn off time will reduce with _____.
- a) Reduction in the reverse voltage.
 - b) Increase in the reverse voltage
 - c) Increase in the forward voltage
 - d) Reduction in forward voltage
48. The control element of an SCR is _____.
- a) Anode
 - b) Cathode
 - c) Gate
 - d) Anode supply

49. One method of forming a three-phase system is to connect the three similar ends of the windings together at one point. This type of connection is called

_____.

- a) Parallel connection
- b) Delta connection
- c) Star connection
- d) Mesh connection

50. The phase voltages are phase shifted from each other by _____degrees.

- a) 90
- b) 150
- c) 120
- d) 180

Q. 2 Long answers

- 1) Explain Construction, working and I-V characteristics of power diode.
- 2) Explain structure and characteristics of Power MOSFET.
- 3) Explain comparison of MOSFET and IGBT.
- 4) Explain structure and I-V characteristics of SCR.
- 5) Explain concept of di/dt and dv/dt protection and also explain Thyristor rating 6) Explain concept of firing angle and half wave controlled convertor with resistive load.
- 7) Explain comparison of HWR, FWR and FWBR.
- 8) Explain single phase bidirectional controller with resistive load.
- 9) Explain applications of power diode.
- 10) Explain structure, operation and drive circuits of IGBT.
- 11) Explain the working of full wave controlled rectifier with neat diagrams and derive the relation for average output voltage for resistive load.

Q. 3 Short answers

- 1) Explain any two applications of Power Electronics
- 2) Explain the types of diodes
- 3) Explain with neat diagram I-V characteristics of power diode.

- 4) Define latching and holding currents in case of SCR.
- 5) Write a short note on Power MOSFET. 6) Explain operation and drive circuit of MOSFET 7) Explain applications of IGBT.
- 8) What is the principle of operation of IGBT?
- 8) Explain construction and working of TRIAC.
- 9) Explain the MOS controlled thyristor.
- 10) Explain the two transistor analogy of SCR.
- 11) Explain the concept of firing angle and conduction angle.
- 12) What is the working principle of controlled rectifiers?
- 13) How does a controlled rectifier used in DC drive?
- 14) What is the half controlled rectifier?
- 15) Explain principle of ON/OFF control.
- 16) Explain what is SMPS and its application.
- 17) Explain any one type of UPS with block diagram.
- 18) What is the principle of induction and dielectric heating?
- 19) Explain the characteristics of power transistor.
- 20) What is structure of IGBT?
- 21) Explain the working principal of induction heating?
- 22) What is uncontrolled bridge rectifier?
- 23) Explain the concept of di/dt and dv/dt protection.
- 24) Explain the concept of single phase and three phase supplies.
- 25) What is conductivity modulation?
- 26) Explain the use of freewheeling diode.