Chettinad College of Engineering & Technology
Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai.

Department of Electrical and Electronics Engineering

EE8017- High Voltage Direct Current Transmission

Unit II - MCQ Bank

1. A 12-pulse bridge is preferred in HVDC because

a) It eliminates certain harmonics

b) It results in better power factor

c) Series connection of converters on D.C. side is better

Answer. a)

2. Fault on a two terminal DC link is removed by

a) Breakers on DC side

b) Breakers on AC side

c) Current control of converters

Answer. C)

3. In HVDC converters, the thyristor are connected in series

a) To provide the required current rating, and they are turned on at the same instant.

b) To provide the required current rating, and they are turned on at different instants.

c) To provide the required voltage rating, and they are turned on at the same instant.

d) To provide the required voltage rating, and they are turned on at different instants.

Answer: c)

4. The minimum possible value of transformer utilization factor is

a) 1.571

b) 1.481

c) 1.391

d) 1.690

Answer: b)

5. Which of the following sentences is/are correct?

1. High speed power reversal without the requirement of mechanical switching is possible in series MTDC system by reversal of the DC voltage polarity.

2. High speed power reversal without the requirement of mechanical switching is possible in parallel MTDC system by reversal of the DC voltage polarity.

3. Series MTDC system has the advantage of possibility of staged development.

4. Parallel MTDC system has the advantage of possibility of staged development.

5. Insulation coordination is a problem in series MTDC system.

6. Insulation coordination is a problem in parallel MTDC system.

7. Permanent fault in a line would lead to complete shutdown in a series MTDC system.

8. Permanent fault in a line would lead to complete shutdown in a parallel MTDC system.

In Options

a) 1,4,5 and 7

b) 2,4,3 and 6

c) 2.4,3 and 8

d) 1,2,3 and 6

Answer: a)

3. The three phase voltage at the AC side terminals of the 6 pulse LCC is sinusoidal and balanced, and there is a constant current source on the DC side. Which of the following sentences is/are correct about following?

1) In a 6 pulse LCC, the 11th order harmonic component in the AC side currents is a characteristic harmonic.

2) In a 6 pulse LCC, the 25th order harmonic component in the AC side currents is a non-characteristic harmonic.

3) In a 6 pulse LCC, the 2nd order harmonic component in the AC side currents is a characteristic harmonic.

4) In a 6 pulse LCC, the 4th order harmonic component in the AC side currents is a non-

characteristic harmonic.

Options

a) 1 and 2

b) 1 and 4

c) 2 and 3

d) 2 and 4

Answer: b)

4. The three phase voltage at the AC side terminals of the 12 pulse LCC is sinusoidal and balanced, the transformers are ideal, and there is a constant current source on the DC side. Which of the following sentences is/are correct about following?

1. In a 12 pulse LCC, the 17th order harmonic component in the AC side currents is a characteristic harmonic.
2. In a 12 pulse LCC, the 19th order harmonic component in the AC side currents is a non-characteristic harmonic.
3. In a 12 pulse LCC, the 35th order harmonic component in the AC side currents is a characteristic harmonic.
4. In a 12 pulse LCC, the 47th order harmonic component in the AC side currents is a non-characteristic harmonic.

Options

a) 1 and 2

b) 1 and 4

c) 2 and 3

d) 2 and 4

Answer: c)

8) In HVDC converter station equipment using thyristor it is necessary to use a large number of thyristor in series because.

a) Current ratings of thyristor are low.

b) Voltage ratings of thyristor are low.

c) Thyristor always fail to an internal open circuit.

d) None of the above.

Answer: b)

9) In the HVDC system, the ac harmonics which get effectively eliminated with 12 pulse bridge converters are..

a) Triplen harmonics

b) Triplen and 5th harmonics

c) Triplen, 5th and 7th harmonics

d) 5th and 7th harmonics

Answer: d)

10) By which of the following method string efficiency can be improved?

a) Using a guard ring

b) Grading the insulator

c) Using long cross arm

d) All of the above

Answer: d) All of the above

11) The voltage drop, for constant voltage transmission is compensated by installing.

a) Inductors

b) Capacitors

c) Synchronous motors

d) All of above

Answer: c)

12) Asynchronous tie line is a

a) AC transmission line

b) DC transmission line

c) either 1 or 2

d) none of the above

Answer: b)

13) Modern HVDC systems are all

(a) 3-pulse converters

(b) 6-pulse converters

(c) 24-pulse converters

(d) 12-pulse converters

Answer: d)

14) The HVDC protections are grouped to:

a) DC protections

b) AC protections ·

c) Apparatus Protective Relays

d) All of these

Answer: d)

15) 12 Pulse converter is which type of converter

a) Line Commutated Converter

b) Voltage Source Converter

c) Both a) and b)

d) None

Answer: a)

16) Which type of connection on the secondary side of transformer-1 and transformer-II is used to obtain phase shift of 30 degrees in 12 pulses Converter?

a) Star-Star

b) Delta-Delta

c) Delta-Star

d) Star-Delta

Answer: d)

17)Which Multi Terminal DC link (MTDC) system is more reliable?

a) Series MTDC

b) Parallel MTDC

c) Both a) and b)

Answer: b)

18)Which statement are true about series MTDC system

1) High speed of reversal of power is possible without mechanical switching

2) More losses in line and in valves

3) The permanent fault in a line section would lead to complete shutdown

4) High speed of reversal of power is possible with mechanical switching Option:

a) All of these

b) Only 1

c) Only1, 2 and 3

d) Only 2,3 and 4

Answer: c)

19)Which statement are true about Parallel MTDC system

1) High speed of reversal of power is possible without mechanical switching

2) More losses in line and in valves

3) The permanent fault in a line section would lead to complete shutdown

4) High speed of reversal of power is possible with mechanical switching Option:

a) All of these

b) Only 4

c) Only1, 2 and 3

d) Only 2,3 and 4

Answer: b)

20)The output voltage equation of 12 pulse converter is

a) $V_d = 2V_{d0} \cos\alpha$

b) $V_d = Vd_0 \cos\alpha$

c) $V_d = 0.5V_{d0} \cos\alpha$

d) $V_d = 3V_{d0} \cos\alpha$

Answer: a)

21) In HVDC transmission there are predominant

a) Voltage harmonics on DC side and current harmonics on AC side of converters

b) Current harmonics on DC side and voltage harmonics on AC side of converters

c) Current harmonics only on the DC side of Converters

d) Voltage harmonics only on the AC side of converters

Answer: a)

22) What are the sources of Harmonics?

a) Power Electronic Application

b) Non Linear Load

c) Both a) and b)

Answer: c)

23) If the firing angle becomes negative, then the rectifier begins to work as

a. A rectifier

b. An inverter

c. A chopper

d. A regulator

Answer: b)

24) Transformer utilization factor is a measure of the merit of a rectifier circuit. It is the ratio of

a. AC input power to the transformer volt – amp rating required by secondary

b. AC input power to the transformer volt – amp rating required by primary

c. DC output power to the transformer volt – amp rating required by secondary

d. DC output power to the transformer volt – amp rating required by primary

Answer: c)

25)Ripple factor is the ratio of

a. Rms value of the ac component of load voltage to the dc voltage

b. Average value of the ac component of load voltage to the peak value of voltage

c. Average value of the dc component of load voltage to the ac voltage

d. Peak value of the dc component of load voltage to the ac voltage

Answer: a)

26)Form factor of a rectifier is the ratio of

a. Root mean square value of voltage and current to its peak value

b. Root mean square value of voltage and current to its average value

c. Average value of current and voltage to its root mean square value

d. Peak value of current and voltage to its root mean square value

Answer: b)

27.To detect an over – current fault condition, the most reliable method is to connect a

a. Current sensor across IGBT

b. Voltage sensor across IGBT

c. Current sensor in series with IGBT

d. Voltage sensor in series with IGBT

Answer: c)

28) The on – state voltage drop of IGBT consists of

a. Drop across the collector junction

b. Drop across the drift region

c. Drop across MOSFET portion

d. All of these

Answer: d.

29)Advantages of HVDC transmission over AC system is / are

a. Reversal of power can be controlled by firing angle

b. Very good dynamic behavior

c. They can link two AC system operating un synchronized

d. All of these

Answer: d)

30) Double edge modulation eliminates certain harmonics when the reference is a

a. Sine wave

b. Square wave

c. Triangular wave

d. Trapezoidal wave

Answer: a)

31) A 12-pulse converter consists of

(a) two 6-pulse converters in series

(b) two 6-pulse converters in parallel

(c) (a) or (b)

(d) (a) and (b)

Answer: a)

32) A pack in an IGBT valve comprises

(a) triggering gate pulse circuit

(b) parallel connect IGBTs

(c) series and parallel connected IGBTs with projection

(d) none of the above

Answer: c)

33) 12-pulse converters are used in modern converters because of

(a) reduced current

(b) reduced ripple

(c) increased voltage and reduced harmonics

(d) both (b) and (c)

Answer: d)

34) In 12-pulse connections, transformers are connected

(a) Delta/Delta (both)

(b) Star/Star (both)

(c) Star/Delta (both)

(d) One Star/Star and other Star/Delta

Answer: d)

35) If pulse number = p, and k is an integer, voltage harmonic generated on the DC side is

(a) pk + 1

(b) pk – 1

(c) 2pk

(d) pk

Answer: d)

36) If pulse number is = p and k is an integer, the voltage harmonic generated on the AC side is

(a) pk

(b) 2pk

(c) pk ± 1

(d) 2pk ± 1

Answer: a)

37) In a 12-pulse converter, the phase difference between the two 6-pulse bridges is

(a) 0°

(b) 60°

(c) 30°

(d) 15°

Answer: c)

38) The lowest current harmonic produced in 12-pulse converters is

(a) 11

(b) 13

(c) 23

(d) 25

Answer: a)

39)Increase in pulse number has the effect of

(a) increasing harmonics

(b) decreasing the harmonic number

(c) increasing the lowest harmonic number

(d) no effect

Answer: c)

40)In a 12-pulse bridge, if one transfers Y–Y has turns ratio 1:1, the other transformer Y–D will have turns ratio

(a) 1:1

(b) 1: 3

(c) 3 :1

(d) 1: 2

Answer: b)

41)Converter transformer act as a source of generation of harmonics because of

(a) Magnetostiction

(b) nonlinear nature of B–H curve of iron core

(c) magnetising current

(d) none of the above

Answer: c)

42)Filters used in 12-pulse converters usually on the AC side are

(a) 5th, 7th and high-pass

(b) 11th, 13th and high-pass

(c) 6th, 12th and high-pass

(d) Only high-pass filter

Answer: b)

43)For power frequency, the harmonic filter acts as a

(a) leading p.f. load supplying leading kVA

(b) lagging p.f. load supplying lagging kVA

(c) (a) or (b) depending on the p.f. of the system

(d) leading p.f. at rectifier end and lagging p.f. at inverter end

Answer: a)

44)The maximum value of the harmonic current depends on

(a) fi ring angle

(b) overlap angle

(c) DC current

(d) both firing angle and overlap angle

Answer: d)

45)Harmonic filters are protected by

(a) overcurrent relays

(b) lightning arresters

(c) spark gaps

(d) none of the above

Answer: b)

46)TIF factor usually lies between

(a) 10 to 25

(b) 20 to 30

(c) 25 to 50

(d) 50 to 100

Answer: c)

47)Advantage of ground return in HV-bipolar DC system is

(a) less power loss

(b) can be built in stages

(c) in the event of fault, 50% power is available

(d) all of the above

(e) none of the above

Answer: d)

48)The ground currents in HVDC system flow through

(a) small area

(b) small area along the line

(c) very large area and does not confine to route of the line

(d) very large area along the route of the line

Answer: c)

49)The earth electrode in the ground return DC line is located from the converter station at a distance of

(a) 1 km

(b) 3 to 5 km

(c) 10 km

(d) 8 to 20 km

Answer: d)

50)The design of land electrode connected to the earth electrode depends on

(a) current and operating time

(b) heat dissipation and safety

(c) current, operating time, life time, polarity, and safety

(d) soil resistivity, thermal conductivity, safety, reliability, and electrode current

Answer: c)