



## BRAINWARE UNIVERSITY

Term End Examination 2023-2024  
Programme – B.Tech.(EE)]-2021  
Course Name – HVDC Transmission  
Course Code - PE-EE601B  
( Semester VI )

Full Marks : 60

Time : 2:30 Hours

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

### Group-A

(Multiple Choice Type Question)

1 x 15=15

1. Choose the correct alternative from the following :
- (i) A back to back HVDC link can be advantageous compared to AC primarily because
    - a) It is cheaper
    - b) Of stability considerations
    - c) Of controlled power glow
    - d) none of the above
  - (ii) Tell that 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
    - d) Shunt connection of converters on D.C. side is better
  - (iii) Choose that voltage regulation of a short transmission line is
    - a) always positive
    - b) always negative
    - c) either positive, negative, or zero
    - d) 1
  - (iv) Identify that shunt compensation for long EHV lines is primarily resorted to
    - a) improve voltage profile
    - b) improve stability
    - c) reduce fault currents
    - d) increase harmonics
  - (v) Tell that bundled conductors are used in EHV lines primarily for
    - a) reducing cost of the line
    - b) reducing corona loss and radio interference
    - c) increasing stability limit.
    - d) none of the above
  - (vi) Identify that inductive interference between power & communication lines can be minimized by
    - a) Increasing the spacing of power line conductors
    - b) Transposing power line conductors
    - c) Transposing communication line conductor
    - d) Either 2 or 3.
  - (vii) Choose from the following the type of insulation is preferred for DC smoothing Reactors
    - a) Air
    - b) Oil
    - c) Paper
    - d) Varnish
  - (viii) Identify the method of voltage control is applied for long line AC transmissions
    - a) Switching by shunt capacitors
    - b) Tap changing transformers

- c) Switching by shunt reactors  
 (ix) Predict in case of a three phase full controlled converter with 6 SCRs, commutation occurs every  
 a) 120°  
 c) 180°  
 (x) Choose from the following are pros of HVDC over AC:  
 a) Absence of Capacitance  
 c) Absence of phase displacement  
 (xi) Identify the name of the filter requires for high voltage dc transmission.  
 a) Line commuted converters  
 c) Both of these  
 (xii) For harmonic reduction by transformer connection, the output voltages from the two inverters must be identified by  
 a) similar and in-phase with each other  
 c) similar but phase shifted from each other  
 (xiii) Predict in single-phase modulation of PWM inverters, the lowest harmonic can be eliminated if the pulse width is made equal to \_\_\_\_\_ °  
 a) 30°  
 c) 120°  
 (xiv) Identify Circuit breakers usually operate under  
 a) Steady short circuit current  
 c) Transient state of short circuit current  
 (xv) Identify in the SCR structure, the gate terminal is located  
 a) near the anode terminal  
 c) near the cathode terminal

d) Static Var sources

b) 60°

d) 30°

b) Absence of inductance

d) All of these

b) Voltage sourced converters

d) None of these

b) dissimilar but in-phase with each other

d) dissimilar and phase shifted from each other

b) 0°

d) 60

b) Sub transient state of short circuit current

d) None of these

b) in between the anode and cathode terminal

d) none of these

### Group-B

(Short Answer Type Questions)

3 x 5=15

2. Discuss about six pulse converter. (3)
3. Explain what is the effect of using source inductance in input of an converter. (3)
4. Explain the relative merits of constant current & constant voltage operation of an HVDC link. (3)
5. Describe the characteristics of DC Lines. (3)
6. Explain the working of induction type overcurrent relay. (3)

OR

Explain in brief the characteristics of electromagnetic relay. (3)

### Group-C

(Long Answer Type Questions)

5 x 6=30

7. An existing 3 phase Ac line of 132 kV is converted into bipolar DC line with maximum system voltage in both the case being same. Estimate the Dc voltage/pole and the number of standard 10inch suspension insulators required. (5)
8. Explain about harmonic filter. (5)
9. Discuss about the different losses in HVDC. (5)
10. Describe how bridge bypass action helps in clearing converter faults. (5)
11. A single phase overhead AC line has inductance /km as 2mH and a capacitance of  $0.125 \times 10^{-7}$  F/ km. Estimate the surge impedance loading of the line when the system voltage is 400 kV. (5)

12. Explain the working of single phase semi converter.

(5)

**OR**

Explain current chopping considered as a serious drawback in a circuit breaker.

(5)

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