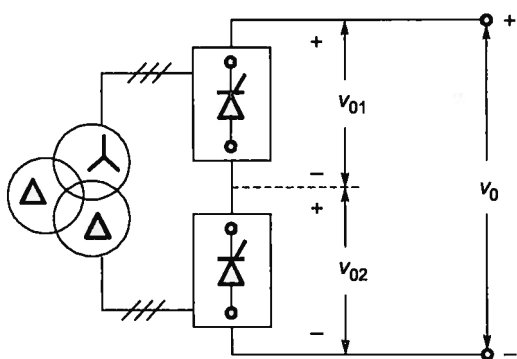


## 7.1 - HVDC



### Multiple Choice Questions

- Q.1** Two six pulse converters, used for a bipolar HVDC transmission system (shown in figure) are rated at 1000 MW,  $\pm 200$  kV



The RMS current rating of each thyristor will be

- (a) 2500 A (b) 1443.4 A  
(c) 2041.2 A (d) 0 A
- Q.2** Consider the following statements regarding the suitable choice of HVDC converter configuration:
1. Pulse number should be high.
  2. Ratio of peak inverse voltage to no load D.C. output voltage should be as high as possible.
  3. Transformer utilization factor should be nearly unity.
- Which of the statements given above are correct?
- (a) 1 and 2 (b) 1, 2 and 3  
(c) 2 and 3 (d) 1 and 3

[ESE-2004]

- Q.3** Consider the following statements regarding HVDC power transmission:

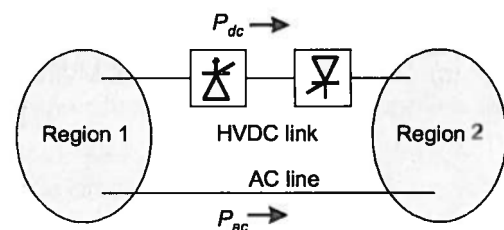
1. The modern HVDC systems use 12-pulse converters.
2. DC systems never use ground or sea return.
3. Most of present-day D.C. schemes are two-terminal links.

Which of the statements given above is/are correct?

- (a) 1, 2 and 3 (b) 1 only  
(c) 2 and 3 only (d) 1 and 3 only

[ESE-2008]

- Q.4** Two regional systems, each having several synchronous generators and loads are interconnected by an ac line and a HVDC link as shown in the figure. Which of the following statements is true in the steady state:



- (a) Both regions need not have the same frequency.  
(b) The total power flow between the regions ( $P_{ac} + P_{dc}$ ) can be changed by controlling the HDVC converters alone.  
(c) The power sharing between the ac line and the HVDC link can be changed by controlling the HDVC converters alone.  
(d) The directions of power flow in the HVDC link ( $P_{dc}$ ) cannot be reversed.

[GATE-2007]

- Q.5** Choose two appropriate auxiliary components of a HVDC transmission system from the following:

- $P$  – D.C. line inductor  
 $Q$  – A.C. line inductor  
 $R$  – Reactive power sources  
 $S$  – Distance relays on D.C. line  
 $T$  – Series capacitance on A.C. line
- (a)  $P$  and  $Q$  (b)  $P$  and  $R$   
(c)  $Q$  and  $S$  (d)  $S$  and  $T$

[GATE-2003]

- Q.6** Out of the considerations listed below:

1. No distance limitation related to steady state stability.
2. No reactive power requirement from the system at the two terminals.
3. No substantial effect on fault level of the two systems at the terminals inspite of the interconnection.
4. No corona problems.

The considerations which constitute advantages of HVDC transmission are:

- (a) 1 and 3 (b) 3 and 4  
(c) 2 and 4 (d) All of the above

[GATE-2000]

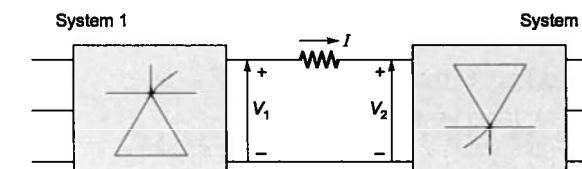
- Q.7** Which one of the following is not true regarding HVDC transmission?

- (a) Corona loss is much more in HVDC transmission.  
(b) The power transmission capacity of bipolar line is almost the same as that of single-circuit ac line.  
(c) HVDC link can operate between two ac systems whose frequencies need not be equal.  
(d) There is no distance limitation for HVDC transmission by underground cable.

[IAS-1995]

- Q.8** Consider a HVDC link which uses thyristor based line-commutated converters as shown in the figure. For a power flow of 750 MW from System 1 to System 2, the voltage at the two ends, and the current are given by:  $V_1 = 500$  kV,

$V_2 = 485$  kV and  $I = 1.5$  kA. If the direction of power flow is to be reversed (that is, from System 2 to System 1) without changing the electrical connections, then which one of the following combinations is feasible?



- (a)  $V_1 = -500$  kV,  $V_2 = -485$  kV and  $I = 1.5$  kA  
(b)  $V_1 = -485$  kV,  $V_2 = -500$  kV and  $I = 1.5$  kA  
(c)  $V_1 = 500$  kV,  $V_2 = 485$  kV and  $I = -1.5$  kA  
(d)  $V_1 = -500$  kV,  $V_2 = -485$  kV and  $I = -1.5$  kA

[2015 : 1 Mark, Set-1]

- Q.9** The power transmission capacity of bipolar lines is approximately

- (a) half that of 3-phase single circuit line.  
(b) the same as that of 3-phase single circuit line.  
(c) twice that of 3-phase single circuit line.  
(d) thrice that of 3-phase single circuit line.

[IAS-1997]

- Q.10** For a 12 pulse operation of HVDC converters, the most trouble some set of harmonics on the ac side of

- (a) 23<sup>rd</sup> and 25<sup>th</sup> (b) 12<sup>th</sup> and 24<sup>th</sup>  
(c) 11<sup>th</sup> and 13<sup>th</sup> (d) 5<sup>th</sup> and 7<sup>th</sup>

[IAS-1999]

- Q.11** Reversal of power flow in HVDC link by controlling the firing angle simultaneously at both the converter stations results in

- (a) reversal of voltage polarity of HVDC pole.  
(b) reversal of current in DC link.  
(c) reversal of current in DC link as well as reversal of voltage polarity of HVDC pole.  
(d) neither reversal of current in DC link nor reversal of voltage polarity of HVDC pole.

[IAS-2000]

## 7.2 - FACTS, Smart Grid and Environmental Implications



### Multiple Choice Questions

**Q.12** Which of the following is FACTS devices is used for load flow control?

- (a) UPFS
- (b) STATCOM
- (c) TCSC
- (d) SVC

**Q.13** Which of the following is not an advantage of fact device?

- (a) It is effective only during heavy loads.
- (b) It improves the stability of the system.
- (c) It increases the load capability of the transmission line.
- (d) It can be used to damp power system oscillations.

**Q.14** In shunt compensation, power system is connected in shunt with the FACTS acts as

- (a) Controllable voltage source
- (b) Controllable current source
- (c) Both controllable current source and voltage source
- (d) None of the above

**Q.15** The term "TSSC" refers to

- (a) Thyristor switched series capacitor
- (b) Thyristor switched static capacitor
- (c) Thyristor switched series compensator
- (d) Thyristor switched static compensator

**Q.16** Combined series-shunt controller is capable of

- (a) real power exchange between the shunt and series controllers.

- (b) reactive power exchange between the shunt and series controllers.
- (c) real and reactive power exchange between the shunt and series controllers.
- (d) None of the above

### Fill in the Blanks:

**Q.17** Fast acting reactive power control is possible by \_\_\_\_ .

**Q.18** For linear loads, the best location to fix FACTS device is at the \_\_\_\_ of the transmission line.

**Q.19** General symbol is for FACTS controller is \_\_\_\_ .

**Q.20** Static var compensators (SVCs) are used primarily in power systems for \_\_\_\_ control.

**Q.21** Expand STATCON \_\_\_\_ .



### Try Yourself

**T1.** Which one of the following is not true regarding HVDC transmission?

- (a) Corona loss is much more in HVDC transmission.
- (b) The power transmission capability of bipolar line is almost the same as that of single circuit ac line.
- (c) HVDC link can operate between two ac system whose frequencies need not be equal.
- (d) There is no distance limitation for HVDC transmission by underground cable.

