



- iii) Under transient condition the consumption of reactive power in HVDC system
- a) is much lesser b) is much higher
- c) remains constant d) none of these.
- iv) Vector power factor in HVDC system is a
- a) measurement factor b) displacement factor
- c) velocity factor d) none of these.
- v) Excitation advance angle operators in
- a) reactive mode b) inverter mode
- c) both (a) and (b) d) none of these.
- vi) In HVDC system commutation time is the
- a) transfer of voltage from one phase to another phase requires a finite time
- b) transfer of current from one phase to another phase requires a finite time
- c) transfer of current from one phase to another phase requires an infinite time
- d) transfer of voltage from one phase to another phase requires an infinite time.
- vii) In inverter mode of operation at commutation
- a) $\alpha > 240^\circ$ b) $\alpha > 120^\circ$
- c) $\alpha < 120^\circ$ d) $\alpha > 60^\circ$.



viii) In terms of RMS line-to-neutral voltage, the no-load direct voltage

- a) $V_{do} = 2.24 E_{LN}$ b) $V_{do} = 2.34 E_{LN}$
 c) $V_{do} = 2.24 E_{LL}$ d) $V_{do} = 2.34 E_{LL}$.

ix) Use of smoothing reactors in HVDC system is to

- a) decrease harmonic voltage and current
 b) increase harmonic voltage and current
 c) decrease harmonic current only
 d) decrease harmonic voltage only.

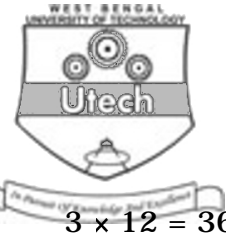
x) 'Back to Back' HVDC system is used for

- a) asynchronous ties b) synchronous ties
 c) both (a) and (b) d) none of these.

GROUP - B

Answer the following questions. 3 × 8 = 24

2. What is 'MTDC' system ? Write its applications. Discuss in brief with diagram, the types of MTDC system. Compare series and parallel MTDC systems.
3. How many types of 'HVDC links' are there ? Discuss with necessary diagram. What are the functions of smoothing reactor ? What are the different applications of DC transmission system ?
4. What is commutation ? What do you mean by single commutation and double commutation failure ? Discuss about 'Back fire' with necessary diagram.



GROUP - C
(Long Answer Type Questions)

Answer the following questions.

3 × 12 = 36

5. In a 6-pulse full-wave bridge circuit with ignition angle α and commutation angle μ , find the voltage drop due to overlap and hence derive the expression of equivalent commutating resistance.
6. A 3- ϕ , 12-pulse rectifier is fed from a transformer with nominal voltage rating of 220 kV / 110 kV.
 - a) If the primary voltage is 230 kV and the effective turns ratio T is 0.42, determine the dc output voltage when the ignition delay angle α is 28° and the commutation angle μ is 16° .
 - b) If the direct current delivered by the rectifier is 2000 A, calculate the effective commutating reactance X_c , RMS fundamental component of alternating current, power factor, $\cos \phi$ and reactive power at the primary side of the transformer.
7. Find the average direct voltage for a 6-pulse full wave bridge circuit with no ignition delay angle. Draw necessary diagram. Also show the direct current I_d for any two (one from upper row and another from lower row) thyristor.

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