

Enrolment No./Seat No _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-VI EXAMINATION – WINTER 2025

Subject Code:3160921

Date:25-11-2025

Subject Name:HVDC Transmission Systems

Time:02:30 PM TO 05:00 PM

Total Marks:70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) List out applications of DC transmission.	03
	(b) Explain types of DC links.	04
	(c) Explain in brief Comparison of AC and DC Transmission (Economics, Technical Performance and Reliability).	07
Q.2	(a) Explain Potential applications of MTDC Systems	03
	(b) Explain Types of Multi-terminal HVDC Systems.	04
	(c) With single line diagram Explain components of HVDC systems.	07
	OR	
	(c) Explain control and Protection of MTDC systems.	07
Q.3	(a) Explain Principles of DC Link control in LCC HVDC systems.	03
	(b) Explain DC line faults in LCC systems.	04
	(c) Explain in brief Configuration and operation of Line Commutated Converters (LCCs).	07
	OR	
Q.3	(a) Explain applications of DC breakers.	03
	(b) Explain function of DC line insulators in HVDC systems.	04
	(c) Explain Reactive Power Control / AC voltage regulation using VSC.	07
Q.4	(a) Principles of DC Link Control in a VSC based HVDC system	03
	(b) Explain DC line faults in VSC systems.	04
	(c) Explain in brief Configuration and operation of Voltage Source Converters (VSCs).	07
	OR	
Q.4	(a) Explain Naturally Sampled PWM.	03
	(b) Explain corona effects in DC line.	04
	(c) Explain firing angle control of HVDC Converters and System.	07
Q.5	(a) Explain Uniformly Sampled PWM	03
	(b) Compare Active filters and Passive filters.	04
	(c) Explain current and extinction angle control of HVDC Converters and System.	07
	OR	
Q.5	(a) Explain basic principles of synchronous and asynchronous links.	03
	(b) Explain classification of power system stability.	04
	(c) Explain analysis of voltage stability in asynchronous AC-DC System.	07

GUJARAT TECHNOLOGICAL UNIVERSITY**BE- SEMESTER-VI (NEW) EXAMINATION – WINTER 2024****Subject Code:3160921****Date:05-12-2024****Subject Name:HVDC Transmission Systems****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) In a HVDC system, discuss the impact of delaying the firing angle of thyristors on 1) Average DC Voltage 2) Harmonic Characteristics	03
	(b) With a schematic diagram, state the various apparatus required for the HVDC system. Discuss purpose of any one of them.	04
	(c) Using a schematic diagram, describe the operation of a 3-phase, 6-pulse Graetz's circuit.	07
Q.2	(a) Discuss how HVDC system can enhance the frequency stability.	03
	(b) Compare performance of AC & DC system with regards to Economical & Technical Parameters.	04
	(c) Describe the process involved in starting and stopping a DC link in a HVDC system.	07
OR		
	(c) For a HVDC system discuss the firing angle control with appropriate firing scheme.	07
Q.3	(a) Discuss in details the impact of Corona on the HVDC System.	03
	(b) Compare: Synchronous & Asynchronous Link	04
	(c) With appropriate diagram explain Selective Harmonic Elimination technique.	07
OR		
Q.3	(a) Explain mitigation steps for reducing the impact of Corona in HVDC Transmission networks.	03
	(b) List out the advantages of utilizing asynchronous link for power transmission.	04
	(c) Discuss in details how VSC is employed for real and reactive power control	07
Q.4	(a) Discuss in details: Phase Locked Loop	03
	(b) Describe Commutation Process.	04
	(c) Explain mono-polar operation of HVDC	07
OR		
Q.4	(a) Explain principles of DC Link Control in a VSC based HVDC system.	03
	(b) Define the term Harmonics. Discuss characteristics harmonics generated in converter application.	04
	(c) Compare the fault response mechanisms in LCC and VSC HVDC systems.	07
Q.5	(a) Describe the impact of transient over-voltages on LCC HVDC systems.	03
	(b) Explain principles of DC Link control in a LCC HVDC system.	04
	(c) Discuss the working and requirements of MTDC. Enlist various types of MTDC used.	07

OR

- Q.5** (a) Explain how reactive power sources influence the stability of HVDC systems. **03**
(b) Discuss in details: DC Circuit Breakers. **04**
(c) Discuss: Modular multilevel converters **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2023****Subject Code:3160921****Date:13-12-2023****Subject Name: HVDC Transmission Systems****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

	MARKS
Q.1 (a) List out the application of DC Transmission.	03
(b) What are the Limitations of HVDC Transmission lines?	04
(c) Give Comparison of AC and DC Transmission.	07
Q.2 (a) List out the Components of a HVDC system.	03
(b) Why Commutation is required in HVDC system?	04
(c) Explain Line Commutated Converter based HVDC Systems.	07
OR	
(c) Explain Voltage Source Converter based HVDC Systems.	07
Q.3 (a) What will be the Effect of Delaying the Firing Instant?	03
(b) What is commutation process in HVDC system?	04
(c) Explain Basic Principal of three-phase AC–DC Conversion, six pulse converter operation.	07
OR	
Q.3 (a) What is the Importance of Reactive power?	03
(b) What do you mean by Rectifier and Inverter operation?	04
(c) Explain Twelve Pulse Converters operation in detail.	07
Q.4 (a) Write down only VSC Operating Principle.	03
(b) Explain Selective Harmonic Elimination	04
(c) Discuss PWM schemes in detail.	07
OR	
Q.4 (a) How Real and Reactive power control using a VSC?	03
(b) Explain Phase Lock Loop (PLL).	04
(c) Discuss Principles of DC Link Control in a VSC based HVDC system in detail.	07
Q.5 (a) What is the role of Smoothing Reactors?	03
(b) Explain Corona effect in DC Line.	04
(c) Discuss Voltage Stability Problem in AC/DC systems.	07
OR	
Q.5 (a) Write down a Principle of Power modulation.	03
(b) List out the Types of Multi-terminal HVDC System.	04
(c) Write a short note on “Modern Trends in HVDC Technology.”	07

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI(NEW) EXAMINATION – WINTER 2022****Subject Code:3160921****Date:17-12-2022****Subject Name:HVDC Transmission Systems****Time:02:30 PM TO 05:00 PM****Total Marks:70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		MARKS
Q.1	(a) Compare AC and DC Transmission in view of economy and reliability.	03
	(b) Enlist limitations of HVDC transmission lines.	04
	(c) Explain six pulse converter with neat diagram.	07
Q.2	(a) Explain characteristics of harmonics.	03
	(b) What will happen, when a line commutated converter operates in inverter mode?	04
	(c) Analyze the effect of delaying the firing angle.	07
OR		
	(c) Explain twelve pulse converters.	07
Q.3	(a) Write components of HVDC system.	03
	(b) Write short note on “corona effect”.	04
	(c) Explain power flow and dc voltage control in VSC based HVDC system	07
OR		
Q.3	(a) What is the function of smoothing reactor?	03
	(b) Write short note on DC breaker.	04
	(c) Explain real and reactive power control using VSC.	07
Q.4	(a) Explain multi-level converter.	03
	(b) Classify PWM techniques.	04
	(c) Explain rotating reference frame theory.	07
OR		
Q.4	(a) Write about PWM.	03
	(b) Explain “Phase-Locked Loop”	04
	(c) What is selective harmonic elimination technic? How to eliminate selective harmonics?	07
Q.5	(a) Differentiate between synchronous and asynchronous link.	03
	(b) How to enhance frequency stability using HVDC control.	04
	(c) Explain mono-polar operation of HVDC.	07
OR		
Q.5	(a) Explain parallel operation of HVDC system.	03
	(b) Explain about multi-terminal HVDC system.	04
	(c) Explain control of power in MTDC.	07
