

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI EXAMINATION – SUMMER 2025****Subject Code: 3160921****Date: 30-05-2025****Subject Name: HVDC Transmission Systems****Time: 10:30 AM TO 01:00 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 Components of a HVDC system.	03
	(b) What are the Limitations of HVDC Transmission lines?	04
	(c) Explain twelve pulse converters.	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 effects of firing angle delay in line commutated converters.	07
Q.3	(a) What do you mean by Rectifier and Inverter operation?	03
	(b) Write short note on “corona effect”.	04
	(c) Write short note on high level controllers.	07
OR		
Q.3	(a) What is commutation process in HVDC system?	03
	(b) Write short note on DC breaker.	04
	(c) Explain mono-polar operation of HVDC.	07
Q.4	(a) Write down a Principle of Power modulation.	03
	(b) Explain “Phase-Locked Loop”	04
	(c) What is selective harmonic elimination technic? How to eliminate selective harmonics?	07
OR		
Q.4	(a) List out the Types of Multi-terminal HVDC System.	03
	(b) Classify PWM techniques.	04
	(c) Explain rotating reference frame theory.	07
Q.5	(a) Explain basic principles of synchronous and asynchronous links.	03
	(b) Explain DC line faults in VSC systems.	04
	(c) Write a short note on “Modern Trends in HVDC Technology.”	07
OR		
Q.5	(a) Explain DC line faults in LCC systems.	03
	(b) Explain modular multi-level converters.	04
	(c) Discuss Voltage Stability Problem in AC/DC systems.	07

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2024****Subject Code:3160921****Date:24-05-2024****Subject Name:HVDC Transmission Systems****Time:10:30 AM TO 01:00 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) State the relative merits of HVDC transmission and HVAC transmission by taking in to consideration (i) Economics of power transmission (ii) Technical Performance (iii) Reliability	03
(b) Explain with neat sketch different types of HVDC links (i) Monopolar HVDC link (ii) Bipolar Homopolar HVDC link and (iii) Homopolar HVDC link.	04
(c) With a neat schematic diagram, state the various apparatus required for HVDC station and explain the purpose of each.	07
Q.2 (a) Sketch the waveforms of output voltage and the transformer secondary current in the case of 3 – phase, 6 pulse bridge circuit (Graetz’s circuit)	03
(b) Identify the various sources for generation of harmonics in HVDC systems and mention the various adverse effects caused due to the presence of harmonics.	04
(c) Distinguish between delay in firing angle α and extinction angle γ of an HVDC converter. Explain the operation of a converter when working as an inverter, and state the necessary conditions required for inverter operation.	07
OR	
(c) Explain 12 pulse converter with schematic diagram.	07
Q.3 (a) State difference in power control in HVDC and HVAC systems and explain the necessity of power control in an HVDC link.	03
(b) Explain the operation of pulse frequency control and state why it is preferred in modern HVDC systems?	04
(c) What do you understand by constant extinction angle control? What are the parameters that should be taken in to account while designing constant extinction angle controller?	07
OR	
Q.3 (a) Explain starting and stopping of an HVDC link.	03
(b) Explain the relative merits and demerits of constant current and constant voltage operation of an HVDC link.	04
(c) Explain real and reactive power control using VSC.	07
Q.4 (a) Explain principles of DC Link control in a LCC HVDC system.	03

- (b) Describe selective harmonic elimination techniques. **04**
(c) Explain basic principles of synchronous and asynchronous links. **07**

OR

- Q.4** (a) Mention the essential requirements of ground electrodes in HVDC systems and explain the necessity of each item briefly. **03**
(b) How are insulators for DC different from that for AC? What are their requirements? **04**
(c) Write notes on voltage stability problems in HVAC/DC systems. **07**
- Q.5** (a) Why are multiterminal DC systems needed? What are the different types of MTDC systems used? **03**
(b) How is power sharing and power control achieved in an MTDC systems. **04**
(c) Give the principle of different types of DC circuit breaker schemes. Why is a surge diverter needed across the DC circuit breaker. **07**

OR

- Q.5** (a) Classify PWM techniques. **03**
(b) What is modular multilevel converter? **04**
(c) Explain different aspects to be considered for a parallel operation in MTDC systems. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2023****Subject Code:3160921****Date:14-07-2023****Subject Name:HVDC Transmission Systems****Time:10:30 AM TO 01:00 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 of AC and DC Transmission.	03
(b) Describe harmonic elimination techniques.	04
(c) Explain various types of HVDC systems.	07
Q.2 (a) Describe Commutation Process.	03
(b) Explain six pulse converter with neat diagram.	04
(c) Explain twelve pulse converters.	07
OR	
(c) Enlist components of HVDC transmission system and explain any two in details.	07
Q.3 (a) Write short note on DC breaker.	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) Classify PWM techniques.	03
(b) List out various characteristic of Harmonics.	04
(c) Write short note on high level controllers.	07
Q.4 (a) What is Current and Extinction Angle Control?	03
(b) Explain “Phase-Locked Loop”	04
(c) Explain in detail control of power in MTDC.	07
OR	
Q.4 (a) Write principles of DC Link Control in a VSC based HVDC system.	03
(b) With sketch explain Sinusoidal Pulse Width Modulation.	04
(c) Enlist different types of insulators. Explain all in short.	07
Q.5 (a) Explain DC line faults in LCC systems.	03
(b) Describe voltage stability problem in AC/DC systems.	04
(c) Write short note on modular multilevel converter.	07
OR	
Q.5 (a) Differentiate between synchronous and asynchronous link.	03
(b) Explain Parallel Operation of HVDC.	04
(c) Explain mono-polar operation of HVDC.	07

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2022****Subject Code:3160921****Date:10/06/2022****Subject Name:HVDC Transmission Systems****Time:10:30 AM TO 01:00 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 of AC and DC Transmission.	03
	(b) What are the limitations of HVDC Transmission lines?	04
	(c) Explain various types of HVDC systems.	07
Q.2	(a) Explain basic principle of three-phase AC–DC conversion.	03
	(b) Describe Commutation Process.	04
	(c) Draw and explain six pulse converter operation.	07
OR		
	(c) Draw and explain twelve pulse converter operation.	07
Q.3	(a) Explain VSC operating principle.	03
	(b) List out various characteristic of Harmonics.	04
	(c) Describe sinusoidal pulse width modulation with diagram.	07
OR		
Q.3	(a) How to do selective harmonic elimination?	03
	(b) Explain firing angle control.	04
	(c) What are the various Higher-level Controllers? Explain any one in detail.	07
Q.4	(a) Explain function of smoothing reactors in HVDC system.	03
	(b) Explain principles of DC Link Control in a VSC based HVDC system.	04
	(c) Describe AC voltage regulation using VSC.	07
OR		
Q.4	(a) Explain function of Ground Electrodes in HVDC system.	03
	(b) Explain principles of DC Link control in a LCC HVDC system.	04
	(c) Explain in detail control of power in MTDC.	07
Q.5	(a) Explain DC line faults in LCC systems.	03
	(b) Describe voltage stability problem in AC/DC systems.	04
	(c) Explain types of multi-terminal HVDC System.	07
OR		
Q.5	(a) Explain DC line faults in VSC systems.	03
	(b) Explain basic principles of synchronous and asynchronous links.	04
	(c) Explain modular multi-level converters.	07
