

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER- VII EXAMINATION – SUMMER 2026

Subject Code:3170906

Date:29-05-2026

Subject Name: Advanced Power Electronics

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) What is the need of Resonant Converter? Give classification of resonant converter.	03
(b) Classify carrier based PWM technique for multilevel inverter. Discuss any one in brief.	04
(c) Draw necessary waveforms and explain working of Boost converter in continuous and discontinuous conduction mode.	07
Q.2 (a) Explain the need of reactive power compensation.	03
(b) Compare HVDC transmission over HVAC transmission based on Economics of Transmission, Technical Performance & Reliability	04
(c) Draw the circuit diagram of 5 level diode clamped multi level inverter and explain the operation with switching table	07
OR	
(c) Draw the circuit diagram of 5 level cascaded H-bridge multi-level inverter and explain the operation with switching table	07
Q.3 (a) Draw only the circuit diagram of flyback, forward and full bridge converter	03
(b) Explain Multi output switch mode regulator with help of circuit diagram.	04
(c) Explain principle of series compensation. Discuss static synchronous series compensator.	07
OR	
Q.3 (a) Give comparison of SVC and STATCOM	03
(b) Explain working principal of UPFC	04
(c) Describe Cuk converter with circuit diagram and necessary waveform.	07
Q.4 (a) Draw only circuit diagram of Zero current switching DC-DC converter and Clamped Voltage topology	03
(b) Illustrate the push pull converter with neat circuit diagram & waveform	04
(c) Explain TCR with circuit diagram. Draw current and voltage waveforms for different values of α .	07
OR	
Q.4 (a) Compare Linear voltage regulator and Switch mode regulator	03
(b) Define FACTS. State the advantages of FACTS devices	04
(c) Justify the name of converter as zero voltage switching converter with necessary diagram and waveform	07
Q.5 (a) Give classification and applications of phase shifting transformer	03

- | | | |
|-----|--|----|
| (b) | Explain concept of multi pulse converter. State advantages and disadvantages of multi-pulse converters. | 04 |
| (c) | Draw block diagram of HVDC transmission system. Discuss equipment required for HVDC system and give their significance | 07 |

OR

- | | | | |
|------------|-----|--|----|
| Q.5 | (a) | Discuss control of HVDC system | 03 |
| | (b) | Give comparison between ZCS and ZVS | 04 |
| | (c) | Which harmonics are dominant in line for a 12-pulse multi-pulse converter? Also, explain how harmonic cancellation occurs in multi-pulse converter | 07 |

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII EXAMINATION – SUMMER 2025

Subject Code:3170906

Date:16-05-2025

Subject Name:Advanced Power Electronics

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) Define duty cycle and write its importance.	03
	(b) Explain fly back converter.	04
	(c) Illustrate the push pull converter with neat circuit diagram & waveform and derive the equation of output voltage in terms of input voltage & duty cycle.	07
Q.2	(a) Differentiate between continuous mode of conduction and Discontinuous mode of conduction	03
	(b) What is the need of Resonant Converter? Compare Series Loaded Resonant (SLR) converter with Parallel loaded resonant (PLR) Converter	04
	(c) What do you mean by Zero Voltage Switching (ZVS). With neat circuit and waveform explain the operation of ZVS Converter	07
	OR	
	(c) Explain the operation of two transistor forward converter with circuit diagram, waveform and required equation.	07
Q.3	(a) Give Classification of resonant converters.	03
	(b) Classify carrier based PWM technique for multilevel inverter. Discuss any one in detail .	04
	(c) Draw circuit diagram and output voltage phasor diagram of 12-pulse converter.	07
	OR	
Q.3	(a) Compare the three topologies of multilevel inverter.	03
	(b) What are the advantages of cascaded H bridge multi-level inverter over other two topologies?	04
	(c) Explain following transformer connection with phasor diagram used in multi pulse converter. (a) Y-Z1 (b) Δ -Z1	07
Q.4	(a) Explain star/delta phase shifting transformer with phasor diagram	03
	(b) What is phase angle compensation in transmission system?	04

	(c)	Explain TCR with circuit diagram. Draw current and voltage waveforms for different values of α	07
		OR	
Q.4	(a)	Explain different types of HVDC link.	03
	(b)	Draw block diagram of HVDC transmission system. Mention equipment required for HVDC system.	04
	(c)	Explain working of Static Synchronous Series Compensator (SSSC) with neat diagrams	07
Q.5	(a)	State the need of reactive power compensation.	03
	(b)	Discuss the principle of series compensation and state various methods for series compensation	04
	(c)	Explain operating principle of Unified power flow controller (UPFC).	07
		OR	
Q.5	(a)	Give classification and applications of phase shifting transformer	03
	(b)	Discuss static characteristics of STATCOM	04
	(c)	Explain the working principle of TSC-TCR.	07

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – SUMMER 2024****Subject Code:3170906****Date:22-05-2024****Subject Name:Advanced Power Electronics****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) Describe SEPIC converter with circuit diagram.	03
	(b) Compare buck, boost and buck-boost converter with reference to technical parameters.	04
	(c) Giving circuit diagram and showing waveforms, explain working of fly – back converter type switched mode DC power supply.	07
Q.2	(a) Classify resonant pulse converter and discuss applications.	03
	(b) Give comparison between Zero Voltage Switching and Zero Current Switching resonant converters.	04
	(c) Discuss operation of parallel load resonant DC to DC converter.	07
	OR	
	(c) Derive output equation for the buck–boost converter with necessary waveform.	07
Q.3	(a) Explain the limitations of Multilevel inverter.	03
	(b) Explain operation of Cascaded H-bridge multilevel inverter.	04
	(c) Justify the sentence, “Space vector pulse width modulation technique is better than sine PWM technique”.	07
	OR	
Q.3	(a) State the advantages of FACTS devices.	03
	(b) Explain working principle of SSSC.	04
	(c) Explain working of STATCOM with neat diagram. Also explain its static characteristic.	07
Q.4	(a) Draw block diagram of HVDC transmission system.	03
	(b) Write the advantages of resonance converter as compared to PWM converter.	04
	(c) Draw the circuit diagram and waveform of 12 pulse converter and explain its working principle.	07
	OR	
Q.4	(a) Differentiate between continuous mode of conduction and discontinuous mode of conduction.	03
	(b) Explain the operation of Class E converter.	04
	(c) Compare HVDC and HVAC transmission systems.	07
Q.5	(a) Discuss the principle of series compensation.	03
	(b) Explain the working of fixed capacitor thyristor-controlled reactor.	04

(c) Explain operating principle of Unified power flow controller. **07**

OR

Q.5 (a) State advantages and disadvantages of multi-pulse converters. **03**

(b) Explain operation of diode clamped multilevel inverter. **04**

(c) Draw the transformer connections for 18 pulse converters. Explain Y-Z2 transformer connection used for multi-pulse converter. **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE – SEMESTER- VII EXAMINATION-SUMMER 2023****Subject Code: 3170906****Date: 26/06/2023****Subject Name: Advanced Power Electronics****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 important advantages, disadvantages and application of SMPS	03
	(b) Explain Flyback converter.	04
	(c) Discuss operation of CUK converter. Derive the relation between duty ratio and i/p voltage.	07
Q.2	(a) Classify the Resonant converter.	03
	(b) What is the need of Resonant Converter? Compare Series Loaded Resonant (SLR) converter with Parallel Loaded Resonant (PLR) converter.	04
	(c) Explain the operation of Zero Voltage Switching resonant converter with circuit diagram, waveform and required equation.	07
	OR	
	(c) Explain operation of Cascaded H-bridge multilevel inverter.	07
Q.3	(a) Explain the concept and need of Multi Level inverter.	03
	Explain difference between multi pulse converter and multilevel converter with suitable diagram.	04
	(b) Draw the transformer connections for 18 pulse converter.	07
	Explain Y-Z2 transformer connection used for multipulse converter.	
	OR	
Q.3	(a) State advantages and disadvantages of Multi-pulse converter.	03
	(b) Compare the three topologies of multilevel inverter	04
	(c) Draw circuit diagram and wave forms of five level diode clamped inverter. Explain its working.	07
Q.4	(a) Explain different type of HVDC link.	03
	(b) Give Comparison of HVAC and HVDC transmission.	04
	(c) Draw and explain bipolar HVDC power transmission system based on 12 pulse converters for each pole.	07
	OR	
Q.4	(a) What is phase angle compensation in transmission line?	03
	(b) Draw the typical HVDC transmission scheme and explain the equipments required for HVDC system.	04
	(c) Discuss importance of reactive power compensation. Discuss phase-shifting transformer with necessary diagram in brief.	07
Q.5	(a) Explain the advantages and limitations of static synchronous series compensator (SSSC).	03
	(b) Define FACTS. Give detail classification of FACTS controller.	04

- (c) Explain the working principle of Thyristorised controlled Reactor (TCR) with neat sketch. **07**

OR

- Q.5** (a) Compare SVC and STATCOM. **03**
(b) What is Synchronous Condenser? **04**
(c) Explain operating principle of Unified Power Flow Controller (UPFC). **07**

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) EXAMINATION – SUMMER 2022****Subject Code:3170906****Date:08/06/2022****Subject Name:Advanced Power Electronics****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) Give comparison between continuous conduction mode and discontinuous conduction mode. | 03 |
| | (b) Discuss static characteristics of SVC. | 04 |
| | (c) Derive output equation for the buck-boost converter with necessary. | 07 |
| Q.2 | (a) Discuss multi output switch mode regulators. | 03 |
| | (b) What is the need of Resonant Converter? Compare Series Loaded Resonant (SLR) converter with Parallel loaded resonant (PLR) Converter. | 04 |
| | (c) Discuss discontinuous mode of operation in buck boost converter with waveforms. | 07 |
| OR | | |
| | (c) Explain zero current switching dc-dc converter. | 07 |
| Q.3 | (a) Explain the concept & need of Multi Level Inverter (MLI) | 03 |
| | (b) What are the advantages of cascaded H bridge multi-level inverter over other two topologies? | 04 |
| | (c) Explain the operation of zero voltage switching resonant converter with circuit diagram, waveform and required equation. | 07 |
| OR | | |
| Q.3 | (a) Draw schematic diagram of 12 pulse converter with transformer connection. | 03 |
| | (b) Discuss difference between series and shunt compensation. | 04 |
| | (c) Discuss sine PWM techniques used for multilevel inverter. | 07 |
| Q.4 | (a) Classification Of FACTS devices. | 03 |
| | (b) Discuss need of phase shifting transformer. | 04 |
| | (c) Explain following transformer connection with phasor diagram used in multi pulse converter. (a) Y-Z1 (b) Δ-Z1 | 07 |
| OR | | |
| Q.4 | (a) Discuss static synchronous series compensator. | 03 |
| | (b) Give comparison of HVAC and HVDC transmission. | 04 |
| | (c) Explain the operation of six pulse diode rectifier with resistive load with necessary diagram and waveform. | 07 |
| Q.5 | (a) Explain working principal of SSSC. | 03 |
| | (b) Comparison of SVC & STATCOM. | 04 |
| | (c) Discuss operation of Flyback converter. Draw its circuit diagram and waveforms. | 07 |

OR

- | | | |
|------------|--|-----------|
| Q.5 | (a) What is the need of Reactive Power Compensation? | 03 |
| | (b) State advantages and limitation of SSSC. | 04 |
| | (c) Explain operating principle of Unified power flow controller (UPFC). | 07 |
