Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII EXAMINATION – WINTER 2025

Subject Code:3170922 Date:13-11-2025

Subject Name:Smart Grids

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)**	Explain the advantages of a smart grid over the conventional grid system.	**03**
	(b)	How the conventional power grid converts into the smart grid. State technical and infrastructural requirements for smart grid.	**04**
	(c)	Discuss in detail the status of smart grid implementation in India.	**07**
Q.2	**(a)**	Which are the distributed energy resources (DERs) used in the smart grid operations? Write the maximum and minimum power capacities of such DERs.	**03**
	(b)	Differentiate between conventional power generation and distributed power generation.	**04**
	(c)	Discuss in detail the issues of distributed generation integration with the existing power grid network.	**07**
		OR	
	(c)	What is islanding? Discuss in detail the methods of islanding detection.	**07**
Q.3	**(a)**	What is smart metering? Briefly explain it with the necessary block diagram.	**03**
	(b)	Mention the benefits of geographic information systems (GISs) in a smart grid.	**04**
	(c)	Elaborate on different communication protocols to be used in smart grid architecture and write specific applications for each.	**07**
		OR	
Q.3	**(a)**	What is a wide area measurement system (WAMS)? Explain the functions of WAMS.	**03**
	(b)	Explain the application of the SCADA system for smooth monitoring and control of smart grid operations with the necessary diagram.	**04**
	(c)	What is a remote terminal unit (RTU)? Explain the evolution of RTU and its components.	**07**
Q.4	**(a)**	What is the role of ZigBee? State the role of ZigBee in the smart grid.	**03**
	(b)	Explain the phasor data concentrator (PDC) with the necessary diagram.	**04**
	(c)	List out types of demand response and explain them in brief with a necessary diagram.	**07**
		OR	
Q.4	**(a)**	What is an intelligent electronic device (IED)? Briefly explain the IED with its functional block diagram.	**03**
	(b)	Describe the role of load dispatch centers in smart grid operations.	**04**
	(c)	Discuss the concept of “self-healing” and elaborate on generalized fault detection and self-healing strategy at the feeder level with an appropriate diagram.	**07**

Q.5	**(a)**	What is IEC 61850? Briefly explain the GOOSE client–server communication with a block diagram.	**03**
	(b)	Classify the time-based tariff.	**04**
	(c)	Explain advanced metering infrastructure (AMI) with a block diagram.	**07**

OR

Q.5	**(a)**	How does the Microgrid differ from the conventional grid? Justify your answer.	**03**
	(b)	What is electric vehicle (EV)? Write the advantages of EVs over conventional vehicles.	**04**
	(c)	What is a V2G system? Explain in detail the challenges of the V2G system.	**07**

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