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Question Paper Code : 90998

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2025.

Fifth/Sixth/Seventh Semester

Electrical and Electronics Engineering

EE 3007 — SMART GRID

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is smart grid and also mention the various components that constitute a smart grid?
2. List any four applications which emerging the areas of smart grid technologies.
3. Differentiate Automated Meter Reading (AMR) from Advanced Metering Infrastructure (AMI) systems.
4. What do you understand by Eavesdropping and Man-in-the-Middle attack with regard to AMI security issues?
5. What are the Grid code requirements for connecting a renewable energy source in to a distribution grid?
6. List out any three communication devices used in Wide Area Network (WAN).
7. What are the basic requirements of a Smart Grid Communication Infrastructure?
8. How does FACTS and HVDC systems contribute to a Smart Grid environment?
9. What are the cyber security requirements of a smart grid?
10. Write the various attacks against cyber resources and their impacts on power systems.

PART B — (5 × 13 = 65 marks)

11. (a) Discuss in detail the Smart Grid Architectural Frame work with neat sketches and explain the control and communication of power systems.

Or

- (b) Discuss in detail the various power electronic topologies for integrating wind and solar power systems into the Smart Micro-Grid. With neat sketch.

12. (a) Explain the concept of consumer indexing, billing, OMS and energy accounting. State how Advanced Metering Infrastructure better than existing power grid scenario.

Or

- (b) With a neat schematic explain the construction and working of a Smart energy meter. Also discuss as to how Time of Day (ToD) pricing can be implemented in smart meter.

13. (a) Explain the role of battery, fuel cell, SMES and super capacitors in developing demand response strategies.

Or

- (b) Explain in detail the power quality issues incorporated in integrating a micro grid to a distribution grid. Comment on the phenomenon of Voltage notching seen in power converter fed distributed generation and methods to overcome such issues.

14. (a) With a neat schematic explain peer to peer communication scheme for implementing FDISR systems.

Or

- (b) (i) List the various issues with regard to grid integration of distributed generation in LV distribution grids. (5)
- (ii) Illustrate with suitable examples how electric utilities, customers, government, and service providers benefit out of developments in smart grid. (8)

15. (a) Discuss the suitability for implementing Zigbee and PLC for Home Area Network and Wi-Max for Wide Area Network.

Or

- (b) Discuss the various smart grid cyber security issues, potential threats, vulnerabilities and their risks with respect to Substation Automation and also give the importance of smart grid security in Electric Vehicle Management.

PART C — (1 × 15 = 15 marks)

16. (a) Discuss in detail the Conceptual Reference Diagram for smart grid information networks with neat diagrams. Also comment on various domains, networks, gateway actors and communication pathways pertaining to control and communication of Electrical Power Grid.

Or

- (b) Compare the various technologies available for implementing Home Area Network (HAN), Field Area Network (FAN) and Wide Area Network (WAN) based on its features and performance.

