



**ST. ANNE'S COLLEGE OF ENGINEERING AND TECHNOLOGY**  
(Approved by AICTE, New Delhi. Affiliated to Anna University, Chennai)  
ANGUCHETTYPALAYAM, PANRUTI – 607 106.

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS  
ENGINEERING**

**QUESTION BANK**

**VI SEMESTER**

**EE3007 – SMART GRID**

**Academic Year 2023-24 (EVEN)**

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## UNIT I INTRODUCTION

Evolution of Energy Systems, Concept, Definitions and Need, Difference between Conventional & Smart Grid, Drivers, structures, functions, opportunities, challenges and benefits of Smart Grid, Basics of Micro grid, National and International Initiatives in Smart Grid.

1	What is smart substation?	BTL 4	Analyze	CO1
2	Define Smart Grid.	BTL 1	Remember	CO1
3	Explain “Real Time Pricing”.	BTL 4	Analyze	CO1
4	List different smart appliances used in home and building automation.	BTL 1	Remember	CO1
6	Enumerate the initiatives taken by Indian economy for smart grid.	BTL 2	Understand	CO2
7	Summarize self-healing grid.	BTL 5	Evaluate	CO2
8	Integrate Feeder Automation.	BTL 6	Create	CO2
9	Show the challenges relate to smart grid.	BTL1	Remember	CO2
10	Describe the smart sub-station.	BTL 1	Remember	CO1
11	Evaluate the necessity of Smart Grid system.	BTL 5	Evaluate	CO1
12	What is the need of distribution management system in electric power distribution system?	BTL 1	Remember	CO2
13	Examine the Resilient Grid.	BTL 3	Apply	CO1
14	Generalize the prominent international policies in smart grid.	BTL 6	Create	CO1
15	List the opportunities relate to smart grid.	BTL 1	Remember	CO1
16	Summarize the self healing grid.	BTL 2	Understand	CO1
17	Show the characteristics of an ideal smart grid.	BTL 3	Apply	CO1
18	Examine the major global smart grid initiatives in India.	BTL 3	Apply	CO1
19	Distinguish the National and international initiatives in smart grid.	BTL 2	Understand	CO1
20	Discuss the present development in smart grid.	BTL 2	Understand	CO2
<b>Part – B</b>				
1	Examine the Evolution of Electric Grid. (13)	BTL 1	Remember	CO2
2	Explain concept of micro grid, and its need and applications. (13)	BTL 4	Analyze	CO1
3	Summarize the Smart grid drivers and functions. (13)	BTL 5	Evaluate	CO1
4	Analyze the need of Smart Grid and Explain neatly with detailed reasons. (13)	BTL 4	Analyze	CO2
5	Define smart grid and describe the Need for	BTL 1	Remember	CO1

	Smart Grid. (13)			
6	Discuss the challenges and benefits in smart grid. (13)	BTL 2	Understand	CO1
7	Describe the National Initiatives in Smart Grid systems. (13)	BTL 1	Remember	CO1
8	Explain the Present development and International policies in Smart Grid. (13)	BTL 4	Analyze	CO2
9	Discuss the International Initiatives in Smart Grid. (13)	BTL 2	Understand	CO1
10	Examine the Overview of the technologies required for the Smart Grid. (13)	BTL 1	Remember	CO1
11	Illustrate the Present development in smart grid. (13)	BTL 3	Apply	CO1
12	Difference between conventional Grid & Smart Grid. (13)	BTL 3	Apply	CO2
<b>Part-C</b>				
1	Explain in detail about International Experience in Smart Grid Deployment Efforts. (15)	BTL 6	Create	CO1
2	Explain in detail about the Architecture of the Smart Grid. (15)	BTL 5	Evaluate	CO2
3	Explain neatly about the Smart Grid Roadmap for INDIA. (15)	BTL 5	Evaluate	CO1
4	Generalize the International policies in Smart Grid and explain the National and International Initiatives in Smart Grid. (15)	BTL6	Create	CO1
<b>UNIT II - SMART METERING</b>				
Introduction to Advanced Metering infrastructure (AMI) - drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Real time management and control, Phasor Measurement Unit (PMU).				
1	Define the AMI standards.	BTL 1	Remember	CO3
2	Analyze the evolution of the electric meter.	BTL 4	Analyze	CO3
3	Evaluate the AMI drivers and benefits.	BTL 5	Evaluate	CO3
4	Quote the AMI protocols.	BTL 1	Remember	CO3
5	Point out the smart energy profile.	BTL 4	Analyze	CO3
6	Describe the AMI needs in the smart grid.	BTL 2	Understand	CO3
7	Examine the AMI security requirements.	BTL 3	Apply	CO3
8	Generalize the time synchronization.	BTL 6	Create	CO3
9	Illustrate the internal device management.	BTL 3	Apply	CO3
10	Discuss the common information model.	BTL 2	Understand	CO3
11	Evaluate the testing and diagnostics.	BTL 5	Evaluate	CO3
12	Explain the local connectivity.	BTL 4	Analyze	CO3

13	Describe the remote configuration.	BTL 2	Understand	CO3
14	Define meter data reads.	BTL 1	Remember	CO3
15	Identify the back office functions of AMI system.	BTL 1	Remember	CO3
16	What is synchro phasor?	BTL 1	Remember	CO3
17	Give the Applications of Phasor Measurement Unit.	BTL 2	Understand	CO3
18	Integrate the Intelligent Electronic Devices	BTL 6	Create	CO3
19	Illustrate the application of Intelligent Electronic Devices.	BTL 3	Apply	CO3
20	Describe the Phasor Measurement Unit.	BTL 1	Remember	CO3
<b>Part-B</b>				
1.	Discuss the Evolution of Meter Reading. (13)	BTL 2	Understand	CO3
2.	Illustrate the AMI Drivers and Benefits. (13)	BTL 3	Apply	CO3
3	Examine the AMI Protocols Standards and Initiatives. (13)	BTL 1	Remember	CO3
4	Describe the Smart Energy Profile. (13)	BTL 1	Remember	CO3
5	Explain the Firmware Upgrades and Time Synchronization in smart grid. (13)	BTL 4	Analyze	CO3
6	Summarize the AMI Security Threats. (13)	BTL 2	Understand	CO3
7	Explain the Integration with Utility Enterprise Applications. (13)	BTL 4	Analyze	CO3
8	What is Local Connectivity? Explain the Remote Configuration. (13)	BTL 1	Remember	CO3
9	Generalize the Phasor Measurement Unit application for monitoring & Explain the protection also. (13)	BTL 6	Create	CO3
10	What is Phasor Measurement Unit (PMU) and explain it. (13)	BTL 1	Remember	CO3
<b>Part-C</b>				
1.	Generalize the AMI needs in the smart grid system. (15)	BTL 6	Create	CO3
2.	Advanced Metering infrastructure (AMI) drivers and benefits. (15)	BTL 5	Evaluate	CO3
3.	Explain the Critical Infrastructure Protection Security Requirements in smart grid. (15)	BTL 5	Evaluate	CO3
<b>UNIT III - SMART GRID TECHNOLOGIES (Transmission)</b>				
Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, Wide area Monitoring, Protection and control.				
<b>Part-A</b>				

1.	What is Sub-station Automation?	BTL 1	Remember	CO2
2.	What is Smart sub-station Automation?	BTL 1	Remember	CO2
3.	Examine the wide area monitoring system in a transmission network.	BTL 3	Apply	CO2
4.	Explain energy management system in smart grid.	BTL 5	Evaluate	CO2
5.	Describe the smart grid technology framework.	BTL 2	Understand	CO2
6.	Discuss the feeder automation.	BTL 2	Understand	CO2
7.	Integrate the Drivers and benefits of WAMPAC.	BTL 6	Create	CO2
8.	What are the major WAMPAC activities?	BTL 1	Remember	CO2
9.	Explain the role of WAMPAC in a smart grid.	BTL 4	Analyze	CO2
10.	Summarize the FACTS in smart grid	BTL 5	Evaluate	CO2
11.	What are the challenges of smart grid transmission technologies?			
12.	What is protection and control?	BTL 4	Analyze	CO3
13.	What are the different types of smart grid transmission technologies?	BTL 2	Understand	CO3
14.	What are the standards for smart grid transmission technologies?	BTL 1	Remember	CO1
15.	What are the future trends in smart grid transmission technologies?	BTL 1	Remember	CO3
16.	What are the environmental benefits of smart grid transmission technologies?	BTL 1	Remember	CO1
17.	How can smart grid transmission technologies help to integrate renewable energy sources into the grid?	BTL 2	Understand	CO3
18.	How can smart grid transmission technologies help to improve the security of the grid?	BTL 6	Create	CO2
19.	What are the best practices for developing smart grid transmission technologies?	BTL 3	Apply	CO2

20.	What are the future of smart grid transmission technologies?	BTL 1	Remember	CO1
Part-B				
1.	Define the Smart substations and explain it.(13)	BTL 1	Remember	CO2
2.	Analyze the Technology Drivers and Smart energy resources. (13)	BTL 4	Analyze	CO2
3.	Examine the Substation Automation. (13)	BTL 1	Remember	CO2
4.	Summarize the Feeder Automation. (13)	BTL 5	Evaluate	CO2
5.	Illustrate the Advances in Energy Management Systems for the Smart Grid. (13)	BTL 3	Apply	CO2
6.	Examine the Flexible AC Transmission Systems in smart grid. (13)	BTL 3	Apply	CO2
7.	Integrate the High Voltage Direct Current in smart grid. (13)	BTL 6	Create	CO1
8.	Explain the Role of WAMPAC in a Smart Grid. (13)	BTL 1	Remember	CO1
9.	Analyze the Wide area monitoring and Protection and control. (13)	BTL 4	Analyze	CO1
10.	How can wide area monitoring improve the efficiency and reliability of the grid? (13)	BTL 6	Create	CO2
Part-C				
1.	Evaluate the Smart Grid Technology Framework. (15)	BTL 5	Evaluate	CO2

2.	What are the challenges and opportunities for future of smart grid transmission technologies? (15)	BTL 6	Create	CO3
<b>UNIT IV - SMART GRID TECHNOLOGIES (Distribution)</b>				
DMS, Volt/VAr control, Fault Detection, Isolation and service restoration, Outage management, High Efficiency Distribution Transformers, Phase Shifting Transformers, Electric Vehicles.				
1.	Compare the benefits of Voltage and Var Control.	BTL 4	Analyze	CO1
2.	Give the Volt/ VAr control equipment on distribution feeder.	BTL 2	Understand	CO1
3.	What is FDIR implementation?	BTL 1	Remember	CO3
4.	Examine the isolation and service restoration.	BTL 3	Apply	CO3
5.	Define the outage management.	BTL 1	Remember	CO3
6.	Identify the faults on distribution systems.	BTL1	Remember	CO3
7.	Generalize the Phase shifting transformers.	BTL 6	Create	CO2
8.	Analyze the high efficiency distribution transformers.	BTL 4	Analyze	CO3
9.	Explain the role PHAN in smart grid.	BTL 3	Apply	CO3
10.	Estimate the distribution SCADA.	BTL 2	Understand	CO3
11.	What is DMS?			
12.	What is isolation and service restoration?	BTL 2	Understand	CO3
13.	What is electric vehicles?	BTL 4	Analyze	CO4
14.	How does DMS help to improve the efficiency and reliability of the grid?	BTL 1	Remember	CO3
15.	How do high-efficiency distribution transformer help to reduce energy losses?	BTL 4	Remember	CO3
16.	What is the future of these technologies?	BTL 6	Create	CO4
17.	What are the challenges of developing these technologies?	BTL 1	Remember	CO4

18.	How can phase shift transformer be used to improve the performance of electric vehicles?	BTL 5	Evaluate	CO4
19.	What are the benefits of developing these technologies?	BTL 3	Apply	CO4
20.	How can DMS be used to improve fault detection?	BTL 1	Remember	CO4
Part-B				
1.	Discuss the Advanced Distribution Management Systems in smart grid. (13)	BTL 2	Understand	CO1
2.	Discuss the High-Efficiency Distribution Transformers in smart grid. (13)	BTL 2	Understand	CO2
3.	Examine the Volt/Var control and Fault Detection in smart grid. (13)	BTL 1	Remember	CO1
4.	Estimate the Isolation and service restoration and Phase Shifting Transformers. (13)	BTL 2	Understand	CO1
5.	Explain the Plug in Hybrid Electric Vehicles (PHEV). (13)	BTL 4	Analyze	CO3
6	How does DMS help to improve the efficiency and reliability of the grid? (13)	BTL 4	Analyze	CO4
7.	How does fault detection help to identify and isolate faults on the grid? (13)	BTL 5	Create	CO4
8.	How does outage management help to reduce the number and duration of outages? (13)	BTL 4	Analyze	CO3
9.	How do electric vehicles help to reduce peak demand and improve the efficiency of the grid? (13)	BTL 2	Understand	CO4



10.	How does Volt/VAR control help to maintain the voltage and power factor of the grid? (13)	BTL 2	Understand	CO4
Part-C				
1.	Summarize the role of transmission systems in smart grid. (15)	BTL 5	Evaluate	CO2
2.	Explain the Outage management and FDIR Implementation in smart grid. (15)	BTL 6	Create	CO2
<b>UNIT V - HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS</b>				
Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Computing technologies for Smart Grid applications (Web Service to CLOUD Computing), Role of big data and IoT, Cyber Security for Smart Grid.				
Part – A				
Q.No.	Questions	BT Level	Competence	Course Outcome
1.	What is HAN?	BTL 1	Remember	CO5
2.	Generalize the two options used in HAN services in demand side management.	BTL 6	Create	CO5
3.	Discuss the Networking Fundamentals.	BTL 2	Understand	CO5
4.	Evaluate the LAN.	BTL 5	Evaluate	CO5
5.	Estimate the Wide Area Network.	BTL 2	Understand	CO5
6.	Point out the Benefits of Home Area Network.	BTL 4	Analyze	CO5
7.	Analyze the various challenges to HAN.	BTL 4	Analyze	CO5
8.	Illustrate the Role of WAN in Smart Grid.	BTL 3	Apply	CO5
9.	What are the Requirements for a Private Wireless WAN?	BTL 1	Remember	CO5
10.	Examine the BPL.	BTL 1	Remember	CO5
11.	Examine the IP based Protocols.	BTL 3	Apply	CO5
12.	Describe the CLOUD Computing to make Smart Grids smarter.	BTL 1	Remember	CO5
13.	Quote the Cloud Computing Applications for Smart Grid.	BTL 1	Remember	CO5
14.	Examine the Basics of Web Service.	BTL 3	Apply	CO5
15.	Estimate the Cyber Security requirements in Smart grid.	BTL 2	Understand	CO5
16.	Describe the Mitigation Approach to Cyber Security Risks.	BTL 2	Understand	CO5

17.	Generalize the Cyber Security Risks for smart grid.	BTL 6	Create	CO5
18.	What is the CLOUD Computing in smart grid?	BTL 1	Remember	CO5
19.	Summarize the Cyber Security for smart grid.	BTL 5	Evaluate	CO5
20.	Explain the real time path rating.	BTL 4	Analyze	CO5
Part – B				
1.	Generalize the Networking Fundamentals for smart grid. (13)	BTL 6	Create	CO5
2.	Evaluate the Local Area Network (LAN). (13)	BTL 5	Evaluate	CO5
3.	Discuss the House Area Network (HAN). (13)	BTL 2	Understand	CO5
4.	Describe the Wide Area Network (WAN). (13)	BTL 2	Understand	CO5
5.	Illustrate the Broadband over Power line (BPL) for smart grid. (13)	BTL 3	Apply	CO5
6.	Estimate the IP is the Right Foundation for the Smart Grid. (13)	BTL 2	Understand	CO5
7.	Examine the Basics of Web Service in smart grid. (13)	BTL 1	Remember	CO5
8.	Describe the CLOUD Computing to make Smart Grids smarter. (13)	BTL 1	Remember	CO5
9.	Illustrate the Cyber Security Functions for Smart Grid. (13)	BTL 3	Apply	CO5
10.	Examine the Authentication and Authorization Services in Cyber Security. (13)	BTL 1	Remember	CO5
11.	Analyze the Network Security Services. (13)	BTL 4	Analyze	CO5
12.	Describe the Confidentiality and Integrity in Security system. (13)	BTL 1	Remember	CO5
13.	Explain the System Integrity and Network Integrity in Security functions. (13)	BTL 4	Analyze	CO5
14.	Explain the Security Threats. (13)	BTL 4	Analyze	CO4
Part – C				
1.	Explain Networking Fundamentals and Local Area Network. (15)	BTL 5	Evaluate	CO5
2.	Generalize Computational Challenges in a Smart Grid. (15)	BTL 6	Create	CO5
3.	Evaluate Basics of Web Service and Cyber Security for Smart Grid. (15)	BTL 5	Evaluate	CO5
4.	Integrate Legacy Transmission and Distribution Automation and also explain the Advancing Smart Grid Standards. (15)	BTL 6	Create	CO5

**Course Outcomes:**

Cos	Course Outcome
CO1	To be able to understand the importance and objectives of Power System Grid.
CO2	To be able to know and understand the concept of a smart grid
CO3	To identify and discuss smart metering devices and associated technologies
CO4	To be able to get an overview of Microgrid and Electric Vehicle Technology
CO5	To be able to have an up to date knowledge on the various computing technologies; to understand the role of Big Data and IoT for effective and efficient operation of Smart Grid.