



SRM VALLIAMMAI ENGINEERING COLLEGE



(An Autonomous Institution)

SRM Nagar, Kattankulathur–603203.

DEPARTMENT OF
ELECTRICAL AND ELECTRONICSENGINEERING

QUESTIONBANK



1916205 – SMART GRID

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

Course Code & Name: 1916205 **SMART GRID**

Semester/ Year : II / 2019-2020 (EVEN)

UNIT I - INTRODUCTION TO SMART GRID				
Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart 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
Part – 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	Integrate the Concept of Resilient. (13)	BTL 6	Create	CO1
8	Estimate the Self Healing Grid. (13)	BTL 2	Understand	CO2
9	Describe the National Initiatives in Smart Grid systems. (13)	BTL 1	Remember	CO1
10	Explain the Present development and International policies in Smart Grid. (13)	BTL 4	Analyze	CO2
11	Discuss the International Initiatives in Smart Grid. (13)	BTL 2	Understand	CO1
12	Examine the Overview of the technologies required for the Smart Grid. (13)	BTL 1	Remember	CO1
13	Illustrate the Present development in smart grid. (13)	BTL 3	Apply	CO1
14	Difference between conventional Grid & Smart Grid. (13)	BTL 3	Apply	CO2
Part-C				
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
UNIT II - SMART GRID TECHNOLOGIES				
Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).				
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 frame work.	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	Estimate the distribution SCADA.	BTL 2	Understand	CO1
12	Compare the benefits of Voltage and VAR	BTL 4	Analyze	CO1

	control.			
13	Give the Volt/ VAR control equipment on distribution feeder.	BTL 2	Understand	CO1
14	What is FDIR implementation?	BTL 1	Remember	CO1
15	Examine the isolation and service restoration.	BTL 3	Apply	CO2
16	Define the outage management.	BTL 1	Remember	CO1
17	Identify the faults on distribution systems.	BTL1	Remember	CO1
18	Generalize the Phase shifting transformers.	BTL 6	Create	CO2
19	Analyze the high efficiency distribution transformers.	BTL 4	Analyze	CO3
20	Explain the role PHAN in smart grid.	BTL 3	Apply	CO3
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	Discuss the Advanced Distribution Management Systems in smart grid. (13)	BTL 2	Understand	CO1
11	Discuss the High-Efficiency Distribution Transformers in smart grid. (13)	BTL 2	Understand	CO2
12	Examine the Volt/Var control and Fault Detection in smart grid. (13)	BTL 1	Remember	CO1
13	Estimate the Isolation and service restoration and Phase Shifting Transformers. (13)	BTL 2	Understand	CO1
14	Explain the Plug in Hybrid Electric Vehicles (PHEV). (13)	BTL 4	Analyze	CO3
Part-C				
1.	Evaluate the Smart Grid Technology Framework. (15)	BTL 5	Evaluate	CO2
2.	Design the IEC 61850 based substation. (15)	BTL 6	Create	CO2
3.	Summarize the role of transmission systems in smart grid. (15)	BTL 5	Evaluate	CO2
4.	Explain the Outage management and FDIR Implementation in smart grid. (15)	BTL 6	Create	CO2
UNIT III - SMART METERS AND ADVANCED METERING INFRASTRUCTURE				
Introduction to Smart Meters, Advanced Metering infrastructure(AMI)drivers and benefits ,AMI protocols, Standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU),Intelligent Electronic Devices(IED)&their application for monitoring & protection.				
Part-A				

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.	Pointout 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	CO1
15.	Identify the back office functions of AMI system.	BTL 1	Remember	CO3
16.	What is synchrophasor?	BTL 1	Remember	CO1
17.	Give the Applications of Phasor Measurement Unit.	BTL 2	Understand	CO3
18.	Integrate the Intelligent Electronic Devices	BTL 6	Create	CO2
19.	Illustrate the application of Intelligent Electronic Devices.	BTL 3	Apply	CO2
20.	Describe the Phasor Measurement Unit.	BTL 1	Remember	CO1
Part-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	CO1
9.	Discuss the IEC 62056 DLMS COSEM Standard. (13)	BTL 2	Understand	CO1
10.	Generalize the Phasor Measurement Unit application for monitoring & Explain the protection also. (13)	BTL 6	Create	CO2
11.	Explain the IED application for monitoring & Explain the protection also. (13)	BTL 4	Analyze	CO3
12.	Evaluate the Intelligent Electronic Devices.(13)	BTL 5	Evaluate	CO3
13.	Illustrate the Phasor networks Installation and Applications. (13)	BTL 3	Apply	CO3
14.	What is Phasor Measurement Unit (PMU) and explain it. (13)	BTL 1	Remember	CO3
Part-C				
1.	Explain the Critical Infrastructure Protection Security Requirements in smart grid. (15)	BTL 5	Evaluate	CO3

2.	Generalize the AMI needs in the smart grid system. (15)	BTL 6	Create	CO3
3.	Advanced Metering infrastructure (AMI) drivers and benefits. (15)	BTL 5	Evaluate	CO3
4.	Evaluate the IED and PMU. (15)	BTL 6	Create	CO3
UNIT IV - POWER QUALITY MANAGEMENT IN SMART GRID				
Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.				
1.	Analyze the power quality management in smart grid.	BTL 4	Analyse	CO4
2.	What is EMC in smart grid?	BTL 1	Remember	CO4
3.	Examine the Photovoltaic systems in smart grid.	BTL 3	Apply	CO4
4.	Summarize the Control of wind turbine.	BTL 5	Evaluate	CO4
5.	Illustrate the Control of hydro turbine.	BTL 3	Apply	CO4
6.	Generalize the Fault current limiting.	BTL 6	Create	CO4
7.	Draw the diagram of decoupled current control method for D-STATCOM.	BTL 1	Remember	CO4
8.	Describe the Load compensation.	BTL 2	Understand	CO4
9.	Discuss the Voltage control.	BTL 2	Understand	CO4
10.	Estimate the shunt active filter.	BTL 2	Understand	CO1
11.	Quote applications of VSC-ES.	BTL 1	Remember	CO4
12.	Summarize the Series compensation in smart grid.	BTL 2	Understand	CO4
13.	Analyze the Thyristor-controlled phase shifting transformer.	BTL 4	Analyze	CO4
14.	Define the Unified power flow controller.	BTL 1	Remember	CO4
15.	Explain the Interline power flow controller.	BTL 4	Remember	CO4
16.	Integrate the CSC-HVDC.	BTL 6	Create	CO4
17.	What is a Voltage source converter?	BTL 1	Remember	CO4
18.	Evaluate the components of a VSC.	BTL 5	Evaluate	CO4
19.	Examine the web based power quality monitoring.	BTL 3	Apply	CO4
20.	What is power quality audit?	BTL 1	Remember	CO4
Part-B				
1.	Describe the Power Quality in smart grid. (13)	BTL 1	Remember	CO4
2.	Examine the EMC in Smart Grid. (13)	BTL 3	Apply	CO4
3.	Generalize the Photovoltaic systems in smart grid. (13)	BTL 6	Analyze	CO4
4.	Illustrate the Fault current limiting in smart grid. (13)	BTL 3	Apply	CO4
5.	Explain the Shunt compensator with energy storage in smart grid. (13)	BTL 4	Analyze	CO4
6.	Explain the Thyristor-controlled phase shifting transformer in smart grid. (13)	BTL 4	Analyze	CO4
7.	Evaluate the Power Quality Conditioners for Smart Grid. (13)	BTL 5	Create	CO4
8.	Explain the Wind hydro and tidal energy systems in smart grid. (13)	BTL 4	Analyze	CO3
9.	Discuss the Series compensation and Active	BTL 2	Understand	CO4

	filter for smart grid. (13)			
10.	Summarize the Energy storage technologies for smart grid. (13)	BTL 2	Understand	CO4
11.	Describe Power Quality Conditioners for Smart Grid. (13)	BTL 1	Remember	CO4
12.	Describe Web based Power Quality monitoring in smart grid. (13)	BTL 1	Remember	CO4
13.	Estimate the Power Quality Audit for smart grid. (13)	BTL 2	Understand	CO4
14.	Describe the superconducting magnetic energy storage systems and Super capacitors. (13)	BTL 1	Remember	CO4
Part-C				
1.	Explain the Power Quality Audit in smart grid and also explain Web based Power Quality monitoring. (15)	BTL 5	Evaluate	CO4
2.	Prepare the case study of Energy storage for wind power. (15)	BTL 6	Create	CO5
3	Evaluate the Power Quality issues of Grid connected Renewable Energy Sources. (15)	BTL 5	Evaluate	CO4
4.	Integrate the case study of Agent-based control of electrical vehicle battery charging. (15)	BTL 6	Create	CO4
UNIT V - HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS				
Networking Fundamentals - Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, 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.	Pointout 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	. Learners will develop more understanding on the concepts of Smart Grid and its present developments.
CO2	Learners will study about different Smart Grid technologies.
CO3	Learners will acquire knowledge about different smart meters and advanced Metering infrastructure.
CO4	Learners will have knowledge on power quality management in Smart Grids.
CO5	Learners will develop more understanding on LAN, WAN and Cloud Computing for Smart Grid applications.