

SRM VALLIAMMAI ENGINEERING COLLEGE



(An Autonomous Institution)

SRM Nagar, Kattankulathur-603203.

DEPARTMENT OF ELECTRICAL AND ELECTRONICSENGINEERING

QUESTIONBANK



1916205 - SMART GRID

Regulation-2019

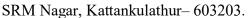
Academic Year 2019–20(EVEN)

Prepared by

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SRM VALLIAMMAI ENGINEERING COLLEGE SRM Nagar, Kattankulathur— 603203.





DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

Course Code & Name: 1916205 SMART GRID Semester/ Year : II / 2019-2020 (EVEN)

UNIT 1 - 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 BTL 1 Remember CO1 building automation. 6 Enumerate the initiatives taken by Indian BTL 2 Understand CO2 economy for smart grid. BTL 5 Evaluate CO2 8 Integrate Feeder Automation. BTL 6 Create CO2 9 Show the challenges relate to smart grid. BTL 1 Remember CO2 10 Describe the smart sub-station. BTL 1 Remember CO2 11 Evaluate the necessity of Smart Grid system. BTL 1 Remember CO1 12 What is the need of distribution management system in electric power distribution system? 13 Examine the Resilient Grid. BTL 1 Remember CO2 14 Generalize the prominent international policies BTL 6 Create CO1 15 List the opportunities relate to smart grid. BTL 1 Remember CO1 16 Summarize the self healing grid. BTL 1 Remember CO1 17 Show the characteristics of an ideal smart grid. BTL 2 Understand CO1 18 Examine the major global smart grid initiatives in BTL 3 Apply CO1 18 Examine the major global smart grid initiatives in STL 3 Apply CO1 19 Distinguish the National and international BTL 2 Understand CO1 10 Discuss the present development in smart grid. BTL 3 Apply CO1 20 Discuss the present development in smart grid. BTL 3 Apply CO1 21 Examine the Evolution of Electric Grid. (13) BTL 1 Remember CO2 22 Explain concept of micro grid, and its need and applications. (13) 3 Summarize the Smart grid drivers and BTL 4 Analyze CO1 Part - B 1 Examine the Evolution of Electric Grid. (13) BTL 1 Remember CO2 Explain concept of micro grid, and its need and applic		LINUT I INTRODUCTION TO O	MADT OD	ID.	
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4 Analyze the need of Smart Grid and Explain BTL 4 Analyze CO2 neatly with detailed reasons. (13)		ι			
neatly with detailed reasons. (13)	4		BTL 4	Analyze	CO2
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J Define smart grid and describe the Need 101 DTL I Remember COI	5	Define smart grid and describe the Need for	BTL 1	Remember	CO1

	Smart Grid. (13)				
6	Discuss the challenges and benefits in smart	BTL 2	Understand	CO1	
	grid. (13)				
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	BTL 1	Remember	CO1	
	systems. (13)				
10	Explain the Present development and	BTL 4	Analyze	CO2	
	International policies in Smart Grid. (13)				
11	Discuss the International Initiatives in Smart	BTL 2	Understand	CO1	
	Grid. (13)				
12	Examine the Overview of the technologies	BTL 1	Remember	CO1	
	required for the Smart Grid. (13)				
13	Illustrate the Present development in smart	BTL 3	Apply	CO1	
	grid. (13)				
14	Difference between conventional Grid & Smart	BTL 3	Apply	CO2	
	Grid. (13)				
	Part-C				
1	Explain in detail about International	BTL 6	Create	CO1	
	Experience in Smart Grid Deployment				
	Efforts. (15)				
2	Explain in detail about the Architecture of	BTL 5	Evaluate	CO2	
	the Smart Grid. (15)				
3	Explain neatly about the Smart Grid	BTL 5	Evaluate	CO1	
	Roadmap for INDIA. (15)				
4	Generalize the International policies in Smart	BTL6	Create	CO1	
	Grid and explain the National and International				
	Initiatives in Smart Grid. (15)				

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	BTL 3	Apply	CO2
	transmission network.			
4	Explain energy management system in smart	BTL 5	Evaluate	CO2
	grid.			
5	Describe the smart grid technology frame	BTL 2	Understand	CO2
	work.			
6	Discuss the feeder automation.	BTL 2	Understand	CO2
7	Integrate the Drivers and benefits of	BTL 6	Create	CO2
	WAMPAC.			
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

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12	control.	DTI 0	TT 1 . 1	001		
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		11 2			
1.	Define the Smart substations and explain it.(13)	BTL 1	Remember	CO2		
2.	Analyze the Technology Drivers and Smart	BTL 4	Analyze	CO2		
	energy resources. (13)					
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	BTL 3	Apply	CO2		
	Systems in smart grid. (13)	2120	1 1777	002		
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	BTL 4	Analyze	CO1		
10	Protection and control. (13) Discuss the Advanced Distribution	BTL 2	Understand	CO1		
	Management Systems in smart grid. (13)					
11	Discuss the High-Efficiency Distribution Transformers in smart grid. (13)	BTL 2	Understand	CO2		
12	Examine the Volt/Var control and Fault	BTL 1	Remember	CO1		
13	Detection in smart grid. (13) Estimate the Isolation and service restoration	BTL 2	Understand	CO1		
13	and Phase Shifting Transformers. (13)	DIL	Onderstand	COI		
14	Explain the Plug in Hybrid Electric Vehicles	BTL 4	Analyze	CO3		
	(PHEV). (13)					
	Part-C					
1.	Evaluate the Smart Grid Technology	BTL 5	Evaluate	CO2		
	Framework. (15)					
2.	Design the IEC 61850 based substation. (15)	BTL 6	Create	CO2		
3.	Summarize the role of transmission systems in	BTL 5	Evaluate	CO2		
4	smart grid. (15)	DTI (C .	002		
4.	Explain the Outage management and FDIR Implementation in smart grid. (15)	BTL 6	Create	CO2		
U	NIT III - SMART METERS AND ADVANCED ME	TERING	NFRASTRUCT	URE		
Introduction to Smart Meters, Advanced Metering infrastructure(AMI)drivers and benefits ,AMI						

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.

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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	BTL 1	Remember	CO3
	system.			
16.	What is synchrophasor?	BTL 1	Remember	CO1
17.	Give the Applications of Phasor Measurement	BTL 2	Understand	CO3
	Unit.			
18.	Integrate the Intelligent Electronic Devices	BTL 6	Create	CO2
19.	Illustrate the application of Intelligent	BTL 3	Apply	CO2
	Electronic Devices.			
20.	Describe the Phasor Measurement Unit.	BTL 1	Remember	CO1
	Part-B		1	
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	BTL 1	Remember	CO3
	Initiatives. (13)			
4.	Describe the Smart Energy Profile. (13)	BTL 1	Remember	CO3
5.	Explain the Firmware Upgrades and Time	BTL 4	Analyze	CO3
	Synchronization in smart grid. (13)			
6.	Summarize the AMI Security Threats. (13)	BTL 2	Understand	CO3
7.	Explain the Integration with Utility Enterprise	BTL 4	Analyze	CO3
' '	Applications. (13)			
8.	What is Local Connectivity? Explain the	BTL 1	Remember	CO1
	Remote Configuration. (13)			_
9.	Discuss the IEC 62056 DLMS COSEM	BTL 2	Understand	CO1
-	Standard. (13)	· -		_
10.	Generalize the Phasor Measurement Unit	BTL 6	Create	CO2
	application for monitoring & Explain the			-
	protection also. (13)			
11.	Explain the IED application for monitoring &	BTL 4	Analyze	CO3
	Explain the protection also. (13)			
12.	Evaluate the Intelligent Electronic Devices.(13)	BTL 5	Evaluate	CO3
13.	Illustrate the Phasor networks Installation and	BTL 3	Apply	CO3
	Applications. (13)		- Tr-J	
14.	What is Phasor Measurement Unit (PMU) and	BTL 1	Remember	CO3
•••	explain it. (13)			202
Part-C				
1.	Explain the Critical Infrastructure Protection	BTL 5	Evaluate	CO3
1.	Security Requirements in smart grid. (15)	2123	L'alaac	203
	200 mily requirements in small gild. (13)			

System. (15) STL 5 Evaluate CO3	_				
Advanced Metering infrastructure (AMI) BTL 5 Evaluate CO3 drivers and benefits. 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 STL 4 Analyze CO4 smart grid. 2. What is EMC in smart grid? 3. Examine the Photovoltaic systems in smart grid. 4. Summarize the Control of wind turbine. BTL 3 Apply CO4 grid. 4. Summarize the Control of wind turbine. BTL 5 Evaluate CO4 Generalize the Fault current limiting. BTL 6 Create CO4 BTL 1 Remember CO4 BTL 2 Understand CO4 BTL 2 Summarize the Series compensation in smart grid. 13. Analyze the Thyristor-controlled phase shifting BTL 4 Analyze CO4 transformer. 14. Define the Unified power flow controller. BTL 1 Remember CO4 Integrate the CSC-HVDC. BTL 6 Create CO4 BTL 5 Evaluate CO4 BTL 7 What is a Voltage source converter? BTL 1 Remember CO4 BTL 8 Evaluate the Components of a VSC. BTL 5 Evaluate CO4 BTL 8 Evaluate the CSC-HVDC. BTL 6 Create CO4 BTL 8 Evaluate the CSC-HVDC. BTL 1 Remember CO4 BTL 1 Reme	2.	Generalize the AMI needs in the smart grid	BTL 6	Create	CO3
drivers and benefits. (15) BTL 6 Create CO3 UNIT IV - POWER QUALITY MANAGEMENT IN SMART GRID			DEL 6	D 1 .	GO2
Evaluate the IED and PMU. (15) BTL 6 Create CO3	3.	, ,	BIL 5	Evaluate	CO3
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	9.	Discuss the Series compensation and Active	BTL 2	Understand	CO4

	filter for smart grid. (13)			
10.	Summarize the Energy storage technologies for	BTL 2	Understand	CO4
	smart grid. (13)			
11.	Describe Power Quality Conditioners for Smart	BTL 1	Remember	CO4
	Grid. (13)			
12.	Describe Web based Power Quality monitoring	BTL 1	Remember	CO4
	in smart grid. (13)			
13.	Estimate the Power Quality Audit for smart	BTL 2	Understand	CO4
	grid. (13)			
14.	Describe the superconducting magnetic energy	BTL 1	Remember	CO4
	storage systems and Super capacitors. (13)			
	Part-C			
1.	Explain the Power Quality Audit in smart grid	BTL 5	Evaluate	CO4
	and also explain Web based Power Quality			
	monitoring. (15)			
2.	Prepare the case study of Energy storage for	BTL 6	Create	CO5
	wind power. (15)			
3	Evaluate the Power Quality issues of Grid	BTL 5	Evaluate	CO4
	connected Renewable Energy Sources. (15)			
4.	Integrate the case study of Agent-based control	BTL 6	Create	CO4
	of electrical vehicle battery charging. (15)			

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	Competence	Course	
		Level		Outcome	
1.	What is HAN?	BTL 1	Remember	CO5	
2.	Generalize the two options used in HAN	BTL 6	Create	CO5	
	services in demand side management.				
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	BTL 1	Remember	CO5	
	Wireless WAN?				
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	BTL 1	Remember	CO5	
	Smart Grids smarter.				
13.	Quote the Cloud Computing Applications for	BTL 1	Remember	CO5	
	Smart Grid.				
14.	Examine the Basics of Web Service.	BTL 3	Apply	CO5	
15.	Estimate the Cyber Security requirements in	BTL 2	Understand	CO5	
	Smart grid.				
16.	Describe the Mitigation Approach to Cyber	BTL 2	Understand	CO5	
	Security Risks.				

17.	Generalize the Cyber Security Risks for smart	BTL 6	Create	CO5
	grid.			
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	BTL 6	Create	CO5
	smart grid. (13)			
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)	BTL 3	Apply	CO5
	for smart grid. (13)			
6.	Estimate the IP is the Right Foundation for the	BTL 2	Understand	CO5
	Smart Grid. (13)			
7.	Examine the Basics of Web Service in smart	BTL 1	Remember	CO5
	grid. (13)			
8.	Describe the CLOUD Computing to make	BTL 1	Remember	CO5
	Smart Grids smarter. (13)			
9.	Illustrate the Cyber Security Functions for	BTL 3	Apply	CO5
	Smart Grid. (13)			
10.	Examine the Authentication and Authorization	BTL 1	Remember	CO5
	Services in Cyber Security. (13)			
11.	Analyze the Network Security Services. (13)	BTL 4	Analyze	CO5
12.	Describe the Confidentiality and Integrity in	BTL 1	Remember	CO5
	Security system. (13)			
13.	Explain the System Integrity and Network	BTL 4	Analyze	CO5
	Integrity in Security functions. (13)			
14.	Explain the Security Threats. (13)	BTL 4	Analyze	CO4
	Part – C	D		96.
1.	Explain Networking Fundamentals and Local	BTL 5	Evaluate	CO5
	Area Network. (15)	D		~~-
2.	Generalize Computational Challenges in a	BTL 6	Create	CO5
	Smart Grid. (15)	D	- 1	~~~
3.	Evaluate Basics of Web Service and Cyber	BTL 5	Evaluate	CO5
	Security for Smart Grid. (15)	D.E. C		96.
4.	Integrate Legacy Transmission and Distribution	BTL 6	Create	CO5
	Automation and also explain the Advancing			
	Smart Grid Standards. (15)			

Course Outcomes:

Cos	Course Outcome			
CO1	. Learners will develop more understanding on the concepts of Smart Grid and its present			
COI	developments.			
CO2	Learners will study about different Smart Grid technologies.			
CO3	Learners will acquire knowledge about different smart meters and advanced			
003	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.			