Q. Code: 733830

Reg. No. | | | | | | | | | | | | | |

B.E./ B. TECH. DEGREE EXAMINATIONS, MAY 2024

Fifth Semester

EE18004 – SMART GRID

(Electrical and Electronics Engineering)

(Regulation 2018 / 2018A)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Analyze challenges and benefits of smart grids and its present developments.	**4**
CO 2	Understand Smart measuring devices.	**3**
CO 3	Acquire knowledge on advanced metering infrastructure and analyzing hardware implementation.	**4**
CO 4	Design of smart grid power system.	**4**
CO 5	Identify suitable computer network for smart grid applications.	**4**

PART- A (10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Depict National Institute of Standards and Technology (NIST) conceptual model for smart grid.	**1**	**3**
2.	Compare and contrast conventional grid and smart grid systems.	**1**	**4**
3.	Brief on the function of wide area monitoring system in a smart grid.	**2**	**2**
4.	Enumerate the salient features of PMU.	**2**	**2**
5.	Interpret the impact of smart meters in outage management system.	**3**	**4**
6.	What is the purpose of a smart meter? Differentiate it against a conventional one?	**3**	**4**
7.	What is the need for slack bus in load flow studies?	**4**	**2**
8.	Differentiate contingency analysis and Congestion Management.	**4**	**4**
9.	Contrast local area network and wide area network.	**5**	**4**
10.	Categorize the cyber-attacks in smart grid.	**5**	**4**

PART- B (5x 14=70Marks)

			Marks	CO	RBT LEVEL
11. (a)	**(i)**	Interpret the opportunities, challenges and benefits in smart grid.	**(10)**	**1**	**4**
	(ii)	Brief on the need for a smart grid environment and its detail on the reasons.	**(4)**	**1**	**4**
		(OR)			
(b)		Illustrate the architecture of smart grid and examine the various stages of evolution in smart grid.	**(14)**	**1**	**4**
12. (a)		Demonstrate in what way the Phasor Measurement Units (PMU) are useful in implementation of smart grid technology.	**(14)**	**2**	**3**

(OR)

(b)	Correlate the operation of substation automation system and distribution automation system with suitable diagram.	**(14)**	**2**	**3**

13. (a)	Sketch and elaborate briefly the advanced metering infrastructure (AMI) with suitable functional block diagram.	**(14)**	**3**	**3**

(OR)

(b)	Explain about Advanced Metering infrastructure (AMI) drivers and benefits and list out the needs of AMI in the smart grid.	**(14)**	**3**	**3**

14. (a)	Examine the contingency and static security assessment (SSA) in smart grid with suitable single line diagram?	**(14)**	**4**	**4**

(OR)

(b)	With step by step procedure and flow chart explain the state estimation solution algorithm in an AC network?	**(14)**	**4**	**4**

15. (a)	Illustrate in detail about the local area network and home area network architecture types in smart grid communication entities.	**(14)**	**5**	**3**

(OR)

(b)	**(i)**	Depict the various layers of internet protocol layers.	**(7)**	**5**	**3**
	(ii)	Explain the different types of cyber attacks in smart grid and why cyber security is most important in smart grid.	**(7)**	**5**	**3**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	A specification sheet of a smart meter states that its rated current is 100 A and power dissipation is 3 W. It employs a current-sensing resistor of 200 μΩ. When the load current is at the rated value of the meter, calculate: (i) The power dissipation in all the other components of the meter; (ii) The voltage across the current-sensing resistor and gain. A specification sheet of a smart meter states that its rated current is 100 A and power dissipation is 3 W. It employs a current-sensing resistor of 200 μΩ. When the load current is at the rated value of the meter, calculate: (i) The power dissipation in all the other components of the meter; (ii) The voltage across the current-sensing resistor and gain. Determine states of the three-bus power system shown in below Figure 1 with the following measurements: Line data: $X_{12} = 0.25$ p.u, $X_{13} = 0.4$ p.u, $X_{23} = 0.2$ p.u. The measured values of line flows are $M_{12} = 0.52$ MW, $M_{13} = 16$ MW, $M_{32} = 28$ MW. Choose the base value as 100 MW, and the variance $\sigma = 0.01$ p.u.	**(10)**	**3**	**5**

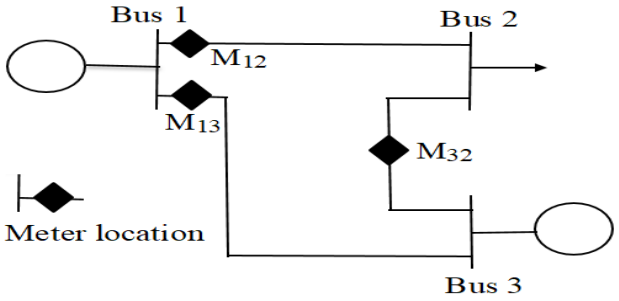

Figure 1

Use dc state estimation to determine the angle at bus 1 and 2 with bus 3 as reference.

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