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Question Paper Code: 99332

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Professional Elective

Electrical and Electronics Engineering

19UEE932- SMART GRID

(Regulations 2019)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. What are the main components of the Smart Grid? CO1- U
 - (a) Advanced digital technologies
 - (b) Renewable energy sources
 - (c) Communication systems
 - (d) All of the above
2. What are the National and International Initiatives in Smart Grid? CO1 -U
 - (a) Government regulations and policies promoting the development of the smart grid
 - (b) Technological advancements in the electric power system
 - (c) Reduced use of renewable energy sources
 - (d) Increased greenhouse gas emissions
3. Which of the following techniques is used for solving non-linear optimization problems in Smart Grid? CO1 -U
 - (a) Evolutionary Algorithms
 - (b) Artificial Intelligence
 - (c) Computational Intelligence
 - (d) None of the above
4. Which of the following techniques is used for Static Optimization in Smart Grid? CO1 -U
 - (a) Artificial Intelligence
 - (b) Evolutionary Algorithms
 - (c) Computational Intelligence
 - (d) None of the above
5. Which protocol is commonly used for AMI communications? CO1 -U
 - (a) Zigbee
 - (b) Wi-Fi
 - (c) Cellular
 - (d) All of the above

6. Which of the following technologies is used for voltage and reactive power control in the smart grid? CO1- U
- (a) Smart meters (b) Phasor Measurement Units
(c) Intelligent Electronic Devices (d) Volt/VAR control
7. Which of the following technologies is used for wide area monitoring in the smart grid? CO1- U
- (a) Phasor Measurement Unit (b) Smart meters
(c) Distribution Management System (d) Volt/VAR control
8. What is a plug-in hybrid vehicle? CO1- U
- (a) A vehicle that runs on both gasoline and electricity
(b) A vehicle that runs on gasoline only
(c) A vehicle that runs on electricity only
(d) None of the above
9. Which of the following is NOT a function of Load Frequency Control (LFC) in Micro Grid System? CO1- U
- (a) To maintain the frequency of the system
(b) To ensure stable operation of the system
(c) To optimize the power generation of the system
(d) None of the above
10. What is the main objective of Load Frequency Control (LFC) in Micro Grid System? CO1- U
- (a) To maintain the frequency of the system (b) To maintain the voltage of the system
(c) To maintain the power factor of the system (d) None of the above

PART – B (5 x 2= 10Marks)

11. What role does technology play in the development of the smart grid? CO1 -U
12. Discuss the role of Computational Fluid Dynamics (CFD) in optimizing the design of wind turbines used in Smart Grids. CO3-App
13. Analyze the benefits of using smart meters in the context of enhancing energy efficiency and reducing costs for consumers. CO2- Ana
14. Discuss the various methods used for Reactive Power Control in Smart Grid. CO1- U
15. What role does technology play in the development of the smart grid? CO1- U

PART – C (5 x 16= 80Marks)

16. (a) Compare and contrast the differences between a conventional grid and a smart grid. CO1- App (16)
- Or
- (b) Discuss the role of smart grid technologies in integrating renewable energy sources and reducing dependence on fossil fuels. CO1- App (16)
17. (a) Analyze the impact of Artificial Intelligence techniques on the job market in the Smart Grid domain. What are the potential implications of these techniques on the future of energy production and distribution? CO2 -App (16)
- Or
- (b) Analyze the applications of Evolutionary Algorithms in Smart Grids. Provide examples of how they can be used to optimize power generation and distribution. CO2- App (16)
18. (a) The 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 $200\mu\Omega$. When the load current is 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. iii) The gain of the PGA to match with an ADC having a full scale of 5 V. CO2 -App (16)
- Or
- (b) Develop a plan to secure an AMI system from cyber-attacks. Identify the potential vulnerabilities and outline strategies to prevent unauthorized access and data breaches. CO2 -App (16)
19. (a) Analyze the role of high-efficiency distribution transformers in reducing energy losses and improving power quality at the distribution level. Evaluate the potential benefits and challenges of using these technologies in the context of reducing carbon emissions and improving energy efficiency. CO4- Ana (16)

Or

- (b) Analyze the significance of Protection and Control in the Smart Grid and discuss how it helps prevent power outages and protect critical infrastructure. CO4- Ana (16)
20. (a) Analyze the various factors affecting the Voltage Control in Micro Grid System. Suggest suitable measures to mitigate these factors. CO2- Ana (16)
- Or
- (b) Analyze the importance of voltage control in Micro Grid System. Discuss the various voltage control methods used in Smart Grid and their impact on system performance. CO2- Ana (16)