A

Reg. No. :

Question Paper Code: 99332

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2023

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   CO1 -U
    optimization problems in Smart Grid?

    (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   CO1 -U
    Smart Grid?

    (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 is the difference between a conventional grid and a smart grid?　　CO1 -U

12. Design an Artificial Intelligence (AI) system for predicting energy demand in a Smart Grid. How can this system be trained and tested to improve its accuracy?　　CO3-App

13. How can AMI systems impact customer engagement and empowerment for energy management and conservation, and what strategies can be used to maximize these benefits?　　CO2- App

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14. How does feeder automation help in reducing power outages and improving system reliability? — CO1- U

15. Compare and contrast the advantages and disadvantages of LFC and Voltage Control in Micro Grid System. — CO1- U

PART – C (5 x 16= 80Marks)

16. (a) Explain the evolution of the electric grid and its current status. — CO1- App (16)

Or

(b) Discuss the role of smart grid technologies in reducing energy losses and increasing energy efficiency — CO1- App (16)

17. (a) Use Artificial Intelligence Techniques to design a predictive maintenance system for Smart Grids. Describe the system architecture and explain how it can improve the reliability and availability of power systems. — CO2 -App (16)

Or

(b) Analyze the potential impact of computational techniques on the reliability and stability of Smart Grid. Discuss how these techniques help in ensuring uninterrupted power supply — 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 200μΩ. 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

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(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) Develop a mathematical model for Load Frequency Control (LFC) in Micro Grid System. Using this model, analyze the impact of LFC on the stability of the system.   CO1- U   (16)

Or

(b) Apply the concepts of Load Frequency Control, Voltage Control, and Reactive Power Control to a practical scenario in Smart Grid. Develop an optimal control strategy for this scenario.   CO1- U   (16)

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