Unit IV

Worksheet– Management and Control Hierarchy of Storage Systems

Part A: Multiple Choice Questions (20 Questions)

Choose the correct answer.

1. The primary purpose of a Battery Management System (BMS) is to:
   - A) Increase electricity prices
   - B) Monitor and control battery charging and discharging
   - C) Generate renewable energy
   - D) Control transmission lines

   Answer: B

2. In an Energy Storage System, the controller defines:
   - A) Battery size
   - B) Transformer rating
   - C) Active and reactive power set-points
   - D) Market prices

   Answer: C

3. Active power is generally represented by:
   - A) Q
   - B) V
   - C) P
   - D) I

   Answer: C

4. Reactive power is represented by:
   - A) Q
   - B) P
   - C) R
   - D) S

   Answer: A

5. Which component converts energy between storage and the grid?
   - A) Battery

- B) Converter
- C) Capacitor
- D) Relay

Answer: B

6. A Virtual Power Plant (VPP) is:
   - A) A thermal power station
   - B) A hydroelectric plant
   - C) Aggregation of distributed generators and storage systems
   - D) A nuclear power plant

   Answer: C

7. Battery SCADA enables:
   - A) Independent battery operation only
   - B) Centralized control of dispersed batteries
   - C) Wind forecasting
   - D) Solar tracking

   Answer: B

8. Load leveling is generally controlled using:
   - A) Local measurements
   - B) Weather forecasts
   - C) Satellite signals
   - D) Market regulations

   Answer: A

9. Wind power smoothing commonly requires:
   - A) Fixed set-points
   - B) No controller
   - C) Remote measurements and forecasts
   - D) Diesel generators

   Answer: C

10. VER stands for:
    - A) Variable Energy Resources
    - B) Voltage Energy Regulation
    - C) Variable Electrical Resistance
    - D) Voltage Enhancement Resource

    Answer: A

11. Examples of VER include:
    - A) Coal and Gas
    - B) Wind and Solar
    - C) Nuclear and Hydro
    - D) Diesel and Biomass

    Answer: B

12. The "Duck Curve" mainly illustrates:
    - A) Battery efficiency
    - B) Renewable energy costs
    - C) Net load variation due to solar generation
    - D) Transformer losses

    Answer: C

13. Energy arbitrage means:
    - A) Storing cheap energy and selling during expensive periods
    - B) Increasing battery size
    - C) Reducing transmission losses
    - D) Controlling frequency

    Answer: A

14. Demand management often utilizes:
    - A) Thermal storage capability
    - B) Coal reserves
    - C) Nuclear fuel
    - D) Transmission upgrades

    Answer: A

15. Which reserve supports sudden system disturbances?
    - A) Flexibility reserve
    - B) Contingency reserve
    - C) Energy reserve
    - D) Market reserve

    Answer: B

16. A major challenge in energy storage optimization is:
    - A) Infinite storage capacity
    - B) Future uncertainties and time dependence
    - C) Lack of electricity demand
    - D) Excess transmission capacity

Answer: B

17. Power system dispatch models primarily estimate:
    - A) Production costs
    - B) Battery chemistry
    - C) Weather conditions
    - D) Consumer preferences

    Answer: A

18. Which method uses historical electricity prices?
    - A) Dispatch model method
    - B) Market price method
    - C) Demand response method
    - D) Forecast method

    Answer: B

19. Regulation reserves are mainly used for:
    - A) Long-term planning
    - B) Fast balancing of supply and demand
    - C) Fuel transportation
    - D) Load shedding

    Answer: B

20. The most common storage representation in dispatch models is:
    - A) Flywheel storage
    - B) Hydrogen storage
    - C) Pumped hydro storage
    - D) Thermal storage

    Answer: C

Part B: Fill in the Blanks (20 Questions)

1. BMS stands for _____.

   Answer: Battery Management System

2. Active power is represented by _____.

   Answer: P

3. Reactive power is represented by _____.

   Answer: Q

4. The converter is a part of the _____ system.

   Answer: power electronics

5. A master controller coordinates multiple _____ controllers.

   Answer: slave

6. Load leveling generally uses _____ control.

   Answer: local

7. Wind power smoothing often requires _____ control.

   Answer: remote

8. VPP stands for _____ _____ _____.

   Answer: Virtual Power Plant

9. Battery SCADA allows centralized control of _____ batteries.

   Answer: dispersed

10. Wind and solar are examples of _____ **Energy Resources**.

    Answer: Variable

11. The Duck Curve is associated with high penetration of _____ energy.

    Answer: solar

12. Energy storage can absorb excess energy during the _____ and release it later.

    Answer: day

13. Demand management often uses _____ storage in buildings and water heaters.

    Answer: thermal

14. Energy arbitrage involves buying electricity when prices are _____.

Answer: low

15. Energy arbitrage involves selling electricity when prices are _____.

    Answer: high

16. Contingency reserve helps manage unexpected system _____.

    Answer: disturbances

17. Production cost simulations are performed using _____ models.

    Answer: dispatch

18. Energy storage operation is influenced by future _____ and demand uncertainties.

    Answer: price

19. Pumped hydro is a common representation of energy storage in _____ models.

    Answer: dispatch

20. Energy storage can act as both a generator and a _____.

    Answer: load

Total Marks Suggestion:

- Multiple Choice Questions: 20 × 1 = 20 Marks
- Fill in the Blanks: 20 × 1 = 20 Marks

Total = 40 Marks