Unit-V

Hybrid Energy Systems

1. The primary purpose of a Hybrid Energy System (HES) is to:

A) Use only one energy source
B) Combine two or more energy sources for reliable power generation
C) Increase fuel consumption
D) Eliminate power converters

Answer: B) Combine two or more energy sources for reliable power generation

2. Hybrid energy systems are mainly developed to:

A) Increase power interruptions
B) Improve reliability and efficiency of energy supply
C) Reduce renewable energy utilization
D) Increase transmission losses

Answer: B) Improve reliability and efficiency of energy supply

3. Which of the following is a renewable energy source commonly used in hybrid systems?

A) Coal
B) Diesel
C) Solar Energy
D) Natural Gas

Answer: C) Solar Energy

4. A Solar PV-Wind Hybrid System combines:

A) Solar PV and Diesel Generator only
B) Solar PV and Wind Turbine
C) Hydro and Nuclear Energy
D) Wind and Coal Power Plant

Answer: B) Solar PV and Wind Turbine

5. The major advantage of combining solar and wind energy is:

A) Increased fuel consumption
B) Complementary energy generation throughout the year
C) Higher pollution
D) Reduced efficiency

Answer: B) Complementary energy generation throughout the year

6. Which component stores excess energy in a hybrid renewable energy system?

A) Transformer
B) Battery Bank
C) Generator Rotor
D) Tower

Answer: B) Battery Bank

7. In a hybrid solar-wind system, solar panels generate:

A) AC Power Directly
B) Mechanical Power
C) DC Electrical Power
D) Thermal Power Only

Answer: C) DC Electrical Power

8. Wind turbines convert:

A) Electrical energy into wind energy
B) Wind energy into electrical energy
C) Solar energy into heat energy
D) Mechanical energy into wind energy

Answer: B) Wind energy into electrical energy

9. Which of the following is a type of hybrid energy system?

A) Solar-Wind System
B) Solar-Diesel System
C) Wind-Diesel System
D) All of the Above

Answer: D) All of the Above

10. The charge controller in a hybrid system is used to:

A) Increase wind speed
B) Regulate battery charging and discharging
C) Rotate turbine blades
D) Reduce solar irradiance

Answer: B) Regulate battery charging and discharging

11. The inverter in a hybrid system converts:

A) AC to DC
B) DC to AC
C) AC to AC
D) Mechanical to Electrical

Answer: B) DC to AC

12. Which component is responsible for integrating solar, wind, and battery outputs?

A) Hybrid Controller
B) Tower
C) Gearbox
D) Rotor Blade

Answer: A) Hybrid Controller

13. Grid-connected hybrid systems can:

A) Export excess power to the utility grid
B) Generate power only at night
C) Work without converters
D) Operate only in remote locations

Answer: A) Export excess power to the utility grid

14. Net metering is generally associated with:

A) Stand-alone systems
B) Grid-connected systems
C) Diesel generators
D) Hydro plants

Answer: B) Grid-connected systems

15. One challenge in grid-connected hybrid systems is:

A) Voltage and frequency regulation
B) Blade painting
C) Tower construction
D) Solar panel cleaning only

Answer: A) Voltage and frequency regulation

16. Power electronic converters in hybrid systems are mainly used for:

A) Energy conversion and control
B) Wind measurement only
C) Solar tracking only
D) Mechanical support

Answer: A) Energy conversion and control

17. The architecture of a Solar-Wind Hybrid System typically includes:

A) PV Array, Wind Turbine, Battery, Controller, and Inverter
B) Transformer only
C) Battery only
D) Wind Turbine only

Answer: A) PV Array, Wind Turbine, Battery, Controller, and Inverter

18. Hybrid energy systems are particularly suitable for:

A) Remote and rural electrification
B) Nuclear power plants
C) Coal mines only
D) Thermal stations only

Answer: A) Remote and rural electrification

19. Which factor improves the reliability of hybrid systems compared to single-source systems?

A) Dependence on one energy source
B) Use of multiple energy sources
C) Removal of batteries
D) Elimination of controllers

Answer: B) Use of multiple energy sources

20. The main objective of a Solar-Wind Hybrid System is:

A) Reduce renewable energy usage
B) Provide continuous and reliable power supply
C) Increase carbon emissions
D) Increase transmission losses

Answer: B) Provide continuous and reliable power supply

Fill in the Blank Questions

Need for Hybrid Energy Systems, Types of Hybrid Systems, Solar PV/Wind Hybrid Systems, Architecture, and Grid-Connected Issues

1. Hybrid Energy Systems combine two or more _____ energy sources.

Answer: renewable

2. The primary objective of a Hybrid Energy System is to improve the _____ of power supply.

Answer: reliability

3. A Hybrid Solar PV/Wind System utilizes both solar and _____ energy resources.

Answer: wind

4. Hybrid systems help overcome the _____ nature of renewable energy sources.

Answer: intermittent

5. A Solar PV-Wind Hybrid System can provide power even when one energy source is _____.

Answer: unavailable

6. The main components of a Solar-Wind Hybrid System include PV panels, wind turbines, batteries, and a _____ controller.

Answer: charge

7. In a hybrid system, the battery bank is used to _____ excess energy.

Answer: store

8. A grid-connected hybrid system can exchange power with the utility _____.

Answer: grid

9. The device used to convert DC power into AC power is called an _____.

Answer: inverter

10. The architecture of a Solar-Wind Hybrid System may include both AC and DC _____.

Answer: buses

11. Grid synchronization is necessary before connecting a hybrid system to the utility _____.

Answer: grid

12. Voltage fluctuations and frequency variations are common _____ connected issues.

Answer: grid

13. Net metering allows consumers to export excess electricity to the _____.

Answer: grid

14. Hybrid systems reduce dependence on conventional _____ fuels.

Answer: fossil

15. Proper energy management improves the overall _____ of a hybrid energy system.

Answer: efficiency