Unit-IV

Doubly Fed Induction Generators (DFIG), Squirrel Cage Induction Generators (SCIG), and Control of Power Converters for WEC

1. DFIG stands for:

A) Direct Fed Induction Generator
B) Double Frequency Induction Generator
C) Doubly Fed Induction Generator
D) Dynamic Fed Induction Generator

Answer: C) Doubly Fed Induction Generator

2. In a DFIG, the stator is directly connected to:

A) Battery bank
B) Rotor circuit
C) Utility grid
D) Rectifier

Answer: C) Utility grid

3. The rotor of a DFIG is connected to the grid through:

A) Transformer only
B) Power electronic converters
C) Capacitors only
D) Gearbox only

Answer: B) Power electronic converters

4. A DFIG can operate at:

A) Fixed speed only
B) Variable speed around synchronous speed
C) Zero speed
D) Constant rotor speed only

Answer: B) Variable speed around synchronous speed

5. Which generator is widely used in modern variable-speed wind turbines?

A) DC Generator
B) SCIG
C) DFIG
D) Synchronous Motor

Answer: C) DFIG

6. The major advantage of DFIG is:

A) No power electronics required
B) Reduced energy capture
C) Variable-speed operation with partial-rated converters
D) Higher rotor losses

Answer: C) Variable-speed operation with partial-rated converters

7. SCIG stands for:

A) Single Cage Induction Generator
B) Squirrel Cage Induction Generator
C) Synchronous Cage Induction Generator
D) Speed Controlled Induction Generator

Answer: B) Squirrel Cage Induction Generator

8. SCIG-based wind turbines generally operate at:

A) Variable speed only
B) Fixed speed
C) Zero speed
D) Infinite speed

Answer: B) Fixed speed

9. Which generator has a simple and rugged construction?

A) DFIG
B) SCIG
C) DC Generator
D) Alternator

Answer: B) SCIG

10. Reactive power compensation is often required in:

A) SCIG systems
B) PV modules
C) Batteries
D) Fuel cells

Answer: A) SCIG systems

11. In DFIG systems, power converters are connected to:

A) Stator only
B) Rotor circuit
C) Tower
D) Blades

Answer: B) Rotor circuit

12. The power rating of converters in a DFIG is typically:

A) 100% of generator rating
B) 50% of generator rating
C) 20–30% of generator rating
D) 200% of generator rating

Answer: C) 20–30% of generator rating

13. The Grid-Side Converter (GSC) mainly controls:

A) Rotor speed only
B) DC-link voltage and reactive power
C) Blade pitch angle only
D) Wind speed

Answer: B) DC-link voltage and reactive power

14. The Rotor-Side Converter (RSC) mainly controls:

A) Active and reactive power output
B) Battery charging
C) Tower vibration
D) Transformer cooling

Answer: A) Active and reactive power output

15. The DC-link capacitor in a converter system is used to:

A) Store energy temporarily and smooth voltage
B) Increase wind speed
C) Rotate blades
D) Change generator frequency directly

Answer: A) Store energy temporarily and smooth voltage

16. Which control technique is commonly used for DFIG converters?

A) Scalar Control
B) Vector Control
C) ON/OFF Control only
D) Relay Control

Answer: B) Vector Control

17. The purpose of Maximum Power Point Tracking (MPPT) in wind energy systems is to:

A) Minimize power generation
B) Extract maximum available wind power
C) Increase blade weight
D) Reduce rotor speed to zero

Answer: B) Extract maximum available wind power

18. Back-to-back converters in DFIG systems consist of:

A) Two rectifiers
B) Two transformers
C) Rotor-side converter and grid-side converter connected through a DC link
D) Two batteries

Answer: C) Rotor-side converter and grid-side converter connected through a DC link

19. Compared with SCIG, DFIG offers:

A) Lower efficiency
B) Better speed control and higher energy capture
C) No grid connection capability
D) No reactive power control

Answer: B) Better speed control and higher energy capture

20. The main objective of power converter control in WEC is:

A) Increase tower height
B) Maintain optimal power generation and grid compliance
C) Change blade material
D) Reduce generator size only

Answer: B) Maintain optimal power generation and grid compliance

Fill in the Blank Questions

Doubly Fed Induction Generators (DFIG), Squirrel Cage Induction Generators (SCIG), and Control of Power Converters for Wind Energy Conversion Systems (WECS)

1. The _____ Generator is widely used in modern variable-speed wind turbines.

Answer: Doubly Fed Induction

2. In a DFIG, the stator is directly connected to the _____.

Answer: grid

3. The rotor of a DFIG is connected to the grid through power _____.

Answer: converters

4. A DFIG can operate over a wide range of _____ speeds.

Answer: rotor

5. The major advantage of a DFIG is independent control of active and _____ power.

Answer: reactive

6. In a Squirrel Cage Induction Generator (SCIG), the rotor bars are permanently _____.

Answer: short-circuited

7. An SCIG does not require _____ rings and brushes.

Answer: slip

8. SCIG-based wind turbines generally operate at nearly _____ speed.

Answer: constant

9. Reactive power required by an SCIG is usually supplied by _____ capacitor banks.

Answer: shunt

10. The primary function of a power converter in a WECS is to regulate voltage, frequency, and _____ flow.

Answer: power

11. The converter connected to the generator side is called the _____ Side Converter (GSC).

Answer: Generator

12. The Grid Side Converter helps maintain the DC-link _____ constant.

Answer: voltage

13. Pulse Width Modulation is commonly abbreviated as _____.

Answer: PWM

14. Variable-speed wind turbines extract maximum power by controlling the turbine _____ speed.

Answer: rotational

15. The control system of a wind turbine aims to maximize energy capture while ensuring safe and reliable _____.

Answer: operation