Solar PV Maintenance Exam Prep

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Practice Questions

Try all 30 first, then check the answer key at the back.

1. When conducting insulation resistance testing on a PV array, what is the minimum acceptable value according to IEC 62446-1?

A. 0.5 MΩ per string
B. 10 kΩ per module
C. 100 kΩ regardless of system size
D. 1 MΩ per 1000V of system voltage

2. Which safety equipment is required when conducting live electrical measurements on an operating PV system?

A. Cotton clothing only
B. Standard leather work gloves
C. Insulated gloves rated for the appropriate voltage level
D. Safety glasses only

3. When measuring DC voltage on PV strings, which setting should be used on a digital multimeter?

A. AC voltage (VAC)
B. DC voltage (VDC)
C. Resistance (Ω)
D. Current (A)

4. What is the purpose of conducting a polarity test on PV string wiring?

A. To verify that positive and negative conductors are correctly identified and connected
B. To measure the magnitude of voltage only
C. To check for ground faults
D. To determine the angle of solar irradiance

5. Which instrument is specifically designed for measuring the insulation resistance of PV circuits?

A. Oscilloscope
B. Clamp meter
C. Power analyzer
D. Insulation resistance tester (megohmmeter)

6. When conducting string short circuit current (Isc) tests, what environmental condition should be measured simultaneously?

A. Relative humidity
B. Wind speed
C. Plane of array irradiance
D. Barometric pressure

7. What test verifies the proper functioning of a grid-tied inverter's ability to disconnect from the grid during a utility outage?

A. Power factor test
B. Anti-islanding test
C. Harmonic distortion test
D. Maximum power point tracking test

8. What is the acceptable tolerance for measured open circuit voltage (Voc) compared to calculated values during commissioning?

A. ±5% when adjusted for temperature
B. ±20% regardless of temperature
C. ±1% regardless of temperature
D. ±10% when adjusted for temperature

9. When conducting ground resistance testing on a PV system, what is the maximum acceptable ground resistance value according to most electrical codes?

A. 250 ohms
B. 100 ohms
C. 1 ohm
D. 25 ohms

10. When torquing electrical connections during commissioning, which reference should be consulted for the correct torque specifications?

A. Standard values from general construction guidelines
B. The electrician's preference
C. Manufacturer's installation instructions
D. The same value for all electrical connections

11. What test should be performed before connecting PV module strings in parallel?

A. Current measurement only
B. Voltage measurement to verify similar voltages between strings
C. Wire diameter measurement
D. Connector color verification

12. What is the most likely cause if measured string open circuit voltage (Voc) is significantly lower than expected?

A. Module connection issues such as shorts or incorrect series connections
B. Excessive solar irradiance
C. Inverter overload protection activating
D. Normal variation due to manufacturing tolerances

13. When testing AC voltage at the output of a single-phase inverter in the United States, what is the expected nominal voltage?

A. 380V
B. 120V
C. 480V
D. 240V

14. What is the purpose of performing continuity testing during PV system commissioning?

A. To determine the capacity of the inverter
B. To measure the exact resistance of each wire
C. To verify there are no breaks in the electrical path throughout the system
D. To calculate the efficiency of the modules

15. When measuring insulation resistance, what voltage setting should typically be used for a 600V DC PV system?

A. 250V DC
B. 1000V DC
C. 2500V DC
D. 600V AC

16. What should be done before conducting an insulation resistance test on a PV array?

A. Disconnect all surge protection devices
B. Wet all modules with water
C. Connect all strings in parallel
D. Increase the temperature of all modules

17. Which device is used to verify the torque applied to electrical terminations?

A. Thermal imager
B. Pressure gauge
C. Standard screwdriver
D. Torque screwdriver or wrench

18. What action should be taken if measured short circuit current (Isc) is significantly higher than expected?

A. Add more modules to the string
B. Immediately disconnect the system
C. Recheck the irradiance measurement and calibration of testing equipment
D. Reduce the inverter capacity

19. What is the primary reason for measuring AC voltage at both no-load and full-load conditions?

A. To determine the temperature coefficient of the inverter
B. To identify excessive voltage drop under load
C. To calculate the power factor of the building
D. To program the maximum power point tracking

20. When conducting electrical tests on a PV system, what information must be recorded along with test results according to IEC 62446-1?

A. Test dates, environmental conditions, and test equipment details including calibration information
B. Only the name of the tester
C. Module serial numbers only
D. Only pass/fail results

21. When verifying the installation of a PV array mounting system, which document should be referenced to confirm proper rail spacing?

A. Energy efficiency guidelines
B. Local zoning regulations
C. NFPA 70E safety guidelines
D. Manufacturer installation instructions

22. During a visual inspection of a rooftop PV system, you notice that the array does not match the layout in the approved design documents. What is the appropriate next step?

A. Ignore the discrepancies if the system is functioning
B. Immediately fail the system inspection
C. Document the discrepancies and determine if the changes affect system performance or code compliance
D. Remove and reinstall the entire system

23. According to NEC requirements, what must be visible on all PV system disconnecting means?

A. Manufacturer logo only
B. Clear labeling indicating their purpose
C. Installation date
D. Warranty expiration date

24. During a mechanical inspection of module mounting, what should be verified regarding the mounting hardware?

A. All hardware is properly installed according to manufacturer specifications
B. All hardware is painted to match the roof color
C. Hardware is from a single manufacturer only
D. Hardware is accessible without special tools

25. Which of the following is a critical component of a visual inspection for ground-mounted PV arrays?

A. Proximity to property lines
B. Aesthetic appearance of the array
C. Presence of wildlife barriers
D. Verification of proper grounding

26. When inspecting electrical conduit installations for a PV system, what NEC requirement must be verified?

A. Conduit is buried at least 3 feet deep
B. Conduit is color-coded by voltage
C. Conduit is properly supported and secured at required intervals
D. Conduit is made of a specific material

27. What document should be referenced to verify that the correct modules are installed in a PV system?

A. Module recycling guide
B. Approved design specifications
C. Regional solar incentive program
D. OSHA workplace safety guidelines

28. During visual inspection of a PV system, you notice module frames in contact with the roof surface. What potential issue does this represent?

A. Potential for water damming and roof leaks
B. Increased system efficiency
C. Improved heat dissipation
D. Enhanced wind resistance

29. When inspecting module installations, what should be verified regarding the modules' orientation?

A. Modules are installed to maximize aesthetic appearance
B. Modules face true magnetic north
C. Modules are arranged in alphabetical order by serial number
D. Modules are oriented as specified in the approved design

30. According to electric service provider requirements, where must a utility-accessible disconnect switch typically be located?

A. Adjacent to the inverter regardless of location
B. Inside the customer's garage
C. At the service entrance or meter location
D. On the roof near the array

Answer Key & Explanations

1. D — 1 MΩ per 1000V of system voltage
According to IEC 62446-1, the minimum insulation resistance value is 1 MΩ per 1000V of system voltage, with a minimum of 1 MΩ regardless of system size.

2. C — Insulated gloves rated for the appropriate voltage level
According to NFPA 70E, insulated gloves rated for the appropriate voltage level, arc-rated face shield, and flame-resistant clothing are essential PPE for live electrical work to protect against shock and arc flash hazards.

3. B — DC voltage (VDC)
When measuring DC voltage from PV strings, the multimeter should be set to DC voltage (VDC) mode at a range appropriate for the expected voltage of the string being tested.

4. A — To verify that positive and negative conductors are correctly identified and connected
Polarity testing ensures that positive and negative conductors are correctly identified and connected throughout the system, preventing potential equipment damage or safety hazards from reversed connections.

5. D — Insulation resistance tester (megohmmeter)
An insulation resistance tester (megohmmeter) is specifically designed to apply a high test voltage and measure the resistance of electrical insulation, which is essential for detecting potential insulation failures in PV systems.

6. C — Plane of array irradiance
Plane of array irradiance should be measured simultaneously with Isc testing to correlate the measured current with the available solar resource, allowing for proper comparison to expected values.

7. B — Anti-islanding test
The anti-islanding test verifies that the inverter will detect grid failure and safely disconnect from the utility grid within the required timeframe, preventing dangerous back-feeding during outages.

8. A — ±5% when adjusted for temperature
According to industry standards, measured Voc should be within ±5% of calculated values when adjusted for temperature. Greater variations could indicate module defects or wiring issues.

9. D — 25 ohms
Most electrical codes specify that ground resistance should not exceed 25 ohms for general applications, though some critical installations may require lower values (typically 5-10 ohms).

10. C — Manufacturer's installation instructions
Manufacturer's installation instructions provide the specific torque values for electrical connections in their equipment, which must be followed to ensure proper connection integrity and safety.

11. B — Voltage measurement to verify similar voltages between strings
Voltage measurements should be performed to verify that all strings have similar voltages before connecting them in parallel. Significant differences could indicate wiring errors or module issues.

12. A — Module connection issues such as shorts or incorrect series connections
Significantly lower than expected Voc typically indicates module connections issues, such as shorted modules or incorrect series connections, which affect the cumulative voltage of the string.

13. D — 240V
In the United States, the nominal AC voltage for a single-phase inverter output is typically 240V, which is the standard residential service voltage.

14. C — To verify there are no breaks in the electrical path throughout the system
Continuity testing verifies that there are no breaks in the electrical path throughout the system, ensuring proper connections between components and identifying any open circuits that could affect performance.

15. B — 1000V DC
For a 600V DC PV system, the test voltage for insulation resistance testing should be 1000V DC, which provides adequate stress to detect insulation weaknesses without exceeding system ratings.

16. A — Disconnect all surge protection devices
Before conducting an insulation resistance test, all surge protection devices must be disconnected to prevent damage to the SPDs and to ensure accurate measurement of the insulation resistance.

17. D — Torque screwdriver or wrench
A torque screwdriver or wrench is used to apply and verify the specific torque required for electrical terminations, ensuring connections are tight enough for good contact but not over-tightened.

18. C — Recheck the irradiance measurement and calibration of testing equipment
If measured Isc is significantly higher than expected, the commissioning specialist should recheck the irradiance measurement and calibration of testing equipment, as high current could indicate measurement errors or unusually high irradiance conditions.

19. B — To identify excessive voltage drop under load
Measuring AC voltage at both no-load and full-load conditions helps identify excessive voltage drop under load, which could indicate undersized conductors or connection issues that may affect system performance.

20. A — Test dates, environmental conditions, and test equipment details including calibration information
According to IEC 62446-1, test dates, environmental conditions (temperature, irradiance), and test equipment details including calibration information must be recorded with test results for proper documentation and future reference.

21. D — Manufacturer installation instructions
Manufacturer installation instructions provide specific requirements for mounting system components, including rail spacing requirements which are critical for ensuring structural integrity and warranty compliance.

22. C — Document the discrepancies and determine if the changes affect system performance or code compliance
When an installation does not match the approved design, it's essential to document the discrepancies and

determine if the changes affect system performance or code compliance before proceeding with commissioning.

23. B — Clear labeling indicating their purpose
The NEC requires that all disconnecting means be clearly labeled to indicate their purpose and the equipment they control, ensuring safety during maintenance or emergencies.

24. A — All hardware is properly installed according to manufacturer specifications
Verifying that all hardware is properly installed according to manufacturer specifications is critical for ensuring the structural integrity of the array and preventing failures during high wind or snow events.

25. D — Verification of proper grounding
Verification of proper grounding is critical for safety and code compliance in ground-mounted arrays, as it provides protection against electrical faults and lightning.

26. C — Conduit is properly supported and secured at required intervals
The NEC requires proper support and securing of conduit at specified intervals to prevent sagging, damage, and potential conductor insulation issues over time.

27. B — Approved design specifications
The approved design specifications list the exact module make and model that should be installed, ensuring the system meets expected performance and compatibility requirements.

28. A — Potential for water damming and roof leaks
Module frames in contact with the roof surface can cause water damming, leading to roof leaks and damage over time, and may also indicate improper mounting that could affect array integrity.

29. D — Modules are oriented as specified in the approved design
The module orientation should match the approved design to ensure optimal energy production as specified in the system performance calculations.

30. C — At the service entrance or meter location
Most electric service providers require the utility-accessible disconnect to be located at the service entrance or meter location for safety and easy access during emergencies.

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