



## **Certification Exams**

### **Detailed Content Outlines**

**Level 2** Certified Assistant Technician

**Level 3** Certified Technician

**Level 4** Certified Senior Technician











### III. Component Testing (Continued)

#### G. Circuit Switchers

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### H. Network Protectors

- 1 . Identify properties, types, and applications

#### \* I. Protective Relays

- 1 . Identify types and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### \* J. Instrument Transformers

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### K. Metering Devices

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### L. Regulating Apparatus

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections

#### \* M. Grounding Systems

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results
- 5 . Employ methods of enhancing effectiveness of grounding systems

#### \* N. Ground-Fault Protection Systems

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

### III. Component Testing (Continued)

#### **O. Rotating Machinery**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **\* P. Motor Control Centers and Motor Starters**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **Q. Adjustable-Speed Drive Systems**

- 1 . Identify properties, types, and applications

#### **\* R. Direct-Current Systems**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **S. Surge Arresters**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **T. Capacitors and Reactors**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **U. Outdoor Bus Structures**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **V. Emergency Systems**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results



---

**III. Component Testing (Continued)**

---

**W. Automatic Circuit Reclosers and Line Sectionalizers**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections

**X. Fiber-Optic Cables**

- . Recognize and correctly handle fiber-optic cables

**\* Y. Insulating Liquids and Gases**

- 1 . Identify properties, types, and applications
- 2 . Apply sampling procedures
- 3 . Employ methods and procedures in compliance with ASTM
- 4 . Evaluate test results

**\* Z. Fuses**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

---

**IV. Systems and Commissioning**

**5% of Overall Score**

---

**A. Troubleshooting**

- 1 . Investigate power or protective system faults or malfunctions to determine cause and corrective action required

**B. Functional Testing**

- 1 . Employ methods and procedures for system-function tests upon completion of the individual component tests defined, as system conditions allow
- 2 . Apply concepts of functionality for electrical systems

---

**I. Safety**

---

**13% of Overall Score**

---

**A. Risk Assessment**

- 1 . Identify safe work practices with regard to hazards encountered on the job
- 2 . Identify requirements to create a safe work environment
- 3 . Determine the location and implications of shock and arc-flash protection boundaries

**B. Establishing an Electrically Safe Work Condition**

- 1 . Apply requirements of *NFPA 70E, Article 120: Establishing an Electrically Safe Work Condition*

**C. Lockout/Tagout Procedures**

- 1 . Apply OSHA lockout/tagout requirements

**D. Personal Protective Equipment**

- 1 . Recognize and assess Arc-Flash Hazard/Risk Categories and Shock Protection Boundaries
- 2 . Apply correct use, storage, and testing of personal protective equipment

**E. Safety Equipment Selection**

- 1 . Identify the safety equipment needs of the project (e.g., hotstick, voltage detectors, insulated tools, fire extinguisher, etc.)

**F. Confined Space**

- 1 . Recognize confined space and its hazards
- 2 . Recognize when a confined space becomes a permit-required confined space along with the associated requirements
- 3 . Apply OSHA requirements

**G. Switching and Temporary Protective Grounding**

- 1 . Select and apply correct voltage detection equipment
- 2 . Select and apply correct temporary protective grounding equipment
- 3 . Interpret and apply system switching procedures

**H. Incident Energy Analysis**

- 1 . Interpret field-marked equipment labels
- 2 . Identify hazards where no field-marked labels exist
- 3 . Demonstrate knowledge of incident energy calculation methods
- 4 . Demonstrate knowledge of the variables involved in incident energy calculation methods

**I. Codes and Standards**

- 1 . Apply standards and regulatory organizations (e.g., OSHA, ANSI, ASTM, IEEE, NETA, NFPA, NEMA, etc.)
- 2 . Recognize key provisions of NFPA 70 (e.g., Articles 90, 110.16, 110.21, 225.56, 230.95(C), 250, and 310) and 70E (i.e. Chapter 1: Safety-Related Work Practices and Chapter 2: Safety-Related Maintenance Requirements, etc.)
- 3 . Apply technical requirements of ANSI/NETA Acceptance and Maintenance Testing Standards
- 4 . Practice compliance with manufacturers' published data

---

**II. Electrical Testing Fundamentals and Theory**

---

**23% of Overall Score**

---

**A. Fundamentals of Electricity**

- 1 . Define and apply terms and concepts from physics, electricity, heat, and chemistry
- 2 . Recognize and define the standard units used to describe electrical circuits, energy, and power
- 3 . Identify series and parallel circuits
- 4 . Recognize the sources and effects of electromagnetic fields
- 5 . Demonstrate knowledge of dielectric properties of various types of insulations
- 6 . Demonstrate knowledge of phasing and phase rotation

**B. Electrical Calculations**

- 1 . Perform mathematical calculations utilizing basic algebra, geometry, and trigonometry
- 2 . Apply fundamental electrical laws to simple circuits (e.g., Ohm's law, Kirchhoff's law, etc.)
- 3 . Apply conversions between units (e.g., microhms to milliohms, horsepower to kilowatts, etc.)

**C. AC and DC Circuits**

- 1 . Calculate simple single-loop ac circuits with RLC components
- 2 . Calculate equivalent resistance of and power consumed by resistive circuits
- 3 . Calculate equivalent capacitance and inductance
- 4 . Apply methods for measuring and calculating impedance and power
- 5 . Calculate variables of complex ac and dc circuits (e.g., voltage drop, current flow, power, etc.)
- 6 . Calculate phase angle, power factor, and vectors

**D. Insulation Testing**

- 1 . Employ methods and procedures for insulation tests and analyze results

**E. Resistance Testing**

- 1 . Employ methods and procedures for resistance tests and analyze results (e.g., winding resistance, contact resistance, bolted connections, etc.)

**F. Thermographic Survey**

- 1 . Employ methods and procedures for thermographic surveys and analyze results (e.g., emissivity, reflection, delta-T, etc.)

**G. Current Testing**

- 1 . Employ methods and procedures for current tests and analyze results (e.g., overcurrent pickup, circuit burden, voltage drop, etc.)

---

**II. Electrical Testing Fundamentals and Theory (Continued)**

---

**H. System Tests, Analysis, and Operation**

- 1 . Interpret electrical one-line diagrams
- 2 . Interpret ac and dc schematic diagrams, ac three-line diagrams, and connection and interconnection drawings
- 3 . Identify electrical symbols and ANSI device numbers
- 4 . Interpret time-current curves
- 5 . Recognize essential components of short-circuit and coordination studies (e.g., cable size and length, available protective device settings, raceway type, utility fault contribution, etc.)
- 6 . Apply data extracted from short-circuit and coordination studies
- 7 . Recognize cause and effects of power system harmonics

**III. Component Testing****47% of Overall Score****\* A. Switchgear and Switchboard Assemblies**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**\* B. Transformers**

- 1 . Identify properties, types, and applications
- 2 . Identify properties, types, and applications of auxiliary devices
- 3 . Apply visual and mechanical inspections
- 4 . Employ methods and procedures for electrical tests
- 5 . Evaluate test results

**\* C. Cables**

- 1 . Identify properties, types, and applications
- 2 . Identify properties, types, and applications of accessories
- 3 . Apply visual and mechanical inspections
- 4 . Employ methods and procedures for electrical tests
- 5 . Evaluate test results
- 6 . Demonstrate knowledge of cable fault locating

**D. Metal-Enclosed Busways**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**E. Switches**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**\* F. Circuit Breakers**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**G. Circuit Switchers**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

---

**III. Component Testing (Continued)**

---

**H. Network Protectors**

- 1 . Identify properties, types, and applications of protection and control
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**\* I. Protective Relays**

- 1 . Identify types and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**\* J. Instrument Transformers**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**K. Metering Devices**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**L. Regulating Apparatus**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**\* M. Grounding Systems**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results
- 5 . Employ methods of enhancing effectiveness of grounding systems

**\* N. Ground-Fault Protection Systems**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**III. Component Testing (Continued)****\* O. Rotating Machinery**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**P. Motor Control Centers and Motor Starters**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**Q. Adjustable-Speed Drive Systems**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**\* R. Direct-Current Systems**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**S. Surge Arresters**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**T. Capacitors and Reactors**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**U. Outdoor Bus Structures**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**\* V. Emergency Systems**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results



---

**III. Component Testing (Continued)**

---

**W. Automatic Circuit Reclosers and Line Sectionalizers**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

**X. Fiber-Optic Cables**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections

**\* Y. Insulating Liquids and Gases**

- 1 . Identify properties, types, and applications
- 2 . Apply sampling procedures
- 3 . Employ methods and procedures in compliance with ASTM
- 4 . Evaluate test results

**Z. Fuses**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

---

---

**IV. Systems and Commissioning**

**17% of Overall Score**

---

---

**A. Troubleshooting**

- 1 . Investigate power or protective system faults or malfunctions to determine cause and corrective action required

**B. SCADA**

- 1 . Recognize basic requirements, equipment, and configuration of SCADA/DCS systems

**C. Monitoring/DCS Systems**

- 1 . Apply procedures for microprocessor-based power monitoring and control systems

**D. Functional Testing**

- 1 . Employ methods and procedures for system-function tests upon completion of the individual component tests defined, as system conditions allow
  
- 2 . Apply concepts of functionality for electrical systems

---

### I. Safety

---

10% of Overall Score

---

#### A. Risk Assessment

- 1 . Identify safe work practices with regard to hazards encountered on the job
- 2 . Identify requirements to create a safe work environment
- 3 . Determine the location and implications of shock and arc-flash protection boundaries

#### B. Establishing an Electrically Safe Work Condition

- 1 . Apply requirements of *NFPA 70E, Article 120: Establishing an Electrically Safe Work Condition*

#### C. Lockout/Tagout Procedures

- 1 . Apply OSHA lockout/tagout requirements

#### D. Personal Protective Equipment

- 1 . Recognize and assess Arc-Flash Hazard/Risk Categories and Shock Protection Boundaries
- 2 . Apply correct use, storage, and testing of personal protective equipment

#### E. Safety Equipment Selection

- 1 . Identify the safety equipment needs of the project (e.g., hotstick, voltage detectors, insulated tools, fire extinguisher, etc.)

#### F. Confined Space

- 1 . Recognize confined space and its hazards
- 2 . Recognize when a confined space becomes a permit-required confined space along with the associated requirements
- 3 . Apply OSHA requirements

#### G. Switching and Temporary Protective Grounding

- 1 . Select and apply correct voltage detection equipment
- 2 . Select and apply correct temporary protective grounding equipment
- 3 . Interpret and apply system switching procedures

#### H. Incident Energy Analysis

- 1 . Interpret field-marked equipment labels
- 2 . Identify hazards where no field-marked labels exist
- 3 . Demonstrate knowledge of incident energy calculation methods
- 4 . Demonstrate knowledge of the variables involved in incident energy calculation methods

#### I. Codes and Standards

- 1 . Apply standards and regulatory organizations (e.g., OSHA, ANSI, ASTM, IEEE, NETA, NFPA, NEMA, etc.)
- 2 . Recognize key provisions of NFPA 70 (e.g., Articles 90, 110.16, 110.21, 225.56, 230.95(C), 250, and 310) and 70E (i.e. Chapter 1: Safety-Related Work Practices and Chapter 2: Safety-Related Maintenance Requirements, etc.)
- 3 . Apply technical requirements of ANSI/NETA Acceptance and Maintenance Testing Standards
- 4 . Practice compliance with manufacturer's published data

**II. Electrical Testing Fundamentals and Theory****15 % of Overall Score****A. Fundamentals of Electricity**

- 1 . Define and apply terms and concepts from physics, electricity, heat, and chemistry
- 2 . Recognize and define the standard units used to describe electrical circuits, energy, and power
- 3 . Identify series and parallel circuits
- 4 . Recognize the sources and effects of electromagnetic fields
- 5 . Demonstrate knowledge of dielectric properties of various types of insulations
- 6 . Demonstrate knowledge of phasing and phase rotation

**B. Electrical Calculations**

- 1 . Perform mathematical calculations utilizing basic algebra, geometry, and trigonometry
- 2 . Apply fundamental electrical laws to simple circuits (e.g., Ohm's law, Kirchhoff's law, etc.)
- 3 . Apply conversions between units (e.g., microhms to milliohms, horsepower to kilowatts, etc.)

**C. AC and DC Circuits**

- 1 . Calculate simple single-loop ac circuits with RLC components
- 2 . Calculate equivalent resistance of and power consumed by resistive circuits
- 3 . Calculate equivalent capacitance and inductance
- 4 . Apply methods for measuring and calculating impedance and power
- 5 . Calculate variables of complex ac and dc circuits (e.g., voltage drop, current flow, power, etc.)
- 6 . Calculate phase angle, power factor, and vectors

**D. Insulation Testing**

- 1 . Employ methods and procedures for insulation tests and analyze results

**E. Resistance Testing**

- 1 . Employ methods and procedures for resistance tests and analyze results (e.g., winding resistance, contact resistance, bolted connections, etc.)

**F. Thermographic Survey**

- 1 . Employ methods and procedures for thermographic surveys and analyze results (e.g., emissivity, reflection, delta-T, etc.)

**G. Current Testing**

- 1 . Employ methods and procedures for current tests and analyze results (e.g., overcurrent pickup, circuit burden, voltage drop, etc.)

**H. System Tests, Analysis, and Operation**

- 1 . Interpret electrical one-line diagrams
- 2 . Interpret ac and dc schematic diagrams, ac three-line diagrams, and connection and interconnection drawings
- 3 . Identify electrical symbols and ANSI device numbers
- 4 . Interpret time-current curves
- 5 . Recognize essential components of short-circuit and coordination studies (e.g., cable size and length, available protective device settings, raceway type, utility fault contribution, etc.)
- 6 . Apply data extracted from short-circuit and coordination studies
- 7 . Recognize cause and effects of power system harmonics

---

## III. Component Testing

---

55% of Overall Score

---

### A. Switchgear and Switchboard Assemblies

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

### \* B. Transformers

- 1 . Identify properties, types, and applications
- 2 . Identify properties, types, and applications of auxiliary devices
- 3 . Apply visual and mechanical inspections
- 4 . Employ methods and procedures for electrical tests
- 5 . Evaluate test results

### C. Cables

- 1 . Identify properties, types, and applications
- 2 . Identify properties, types, and applications of accessories
- 3 . Apply visual and mechanical inspections
- 4 . Employ methods and procedures for electrical tests
- 5 . Evaluate test results
- 6 . Demonstrate knowledge of cable fault locating

### D. Metal-Enclosed Busways

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

### E. Switches

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

### \* F. Circuit Breakers

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

### III. Component Testing (Continued)

#### G. Circuit Switchers

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### H. Network Protectors

- 1 . Identify properties, types, and applications of protection and control
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### \* I. Protective Relays

- 1 . Identify types and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### \* J. Instrument Transformers

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### K. Metering Devices

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### L. Regulating Apparatus

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### M. Grounding Systems

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results
- 5 . Employ methods of enhancing effectiveness of grounding systems

### III. Component Testing (Continued)

---

#### **N. Ground-Fault Protection Systems**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **\* O. Rotating Machinery**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **P. Motor Control Centers and Motor Starters**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **Q. Adjustable-Speed Drive Systems**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **R. Direct-Current Systems**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **S. Surge Arresters**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### **T. Capacitors and Reactors**

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

### III. Component Testing (Continued)

---

#### U. Outdoor Bus Structures

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### \* V. Emergency Systems

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### W. Automatic Circuit Reclosers and Line Sectionalizers

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results

#### X. Fiber-Optic Cables

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for optical tests
- 4 . Evaluate test results

#### \* Y. Insulating Liquids and Gases

- 1 . Identify properties, types, and applications
- 2 . Apply sampling procedures
- 3 . Employ methods and procedures in compliance with ASTM
- 4 . Evaluate test results

#### Z. Fuses

- 1 . Identify properties, types, and applications
- 2 . Apply visual and mechanical inspections
- 3 . Employ methods and procedures for electrical tests
- 4 . Evaluate test results



---

**IV. Systems and Commissioning**

**20% of Overall Score**

---

**A. Troubleshooting**

- 1 . Investigate power or protective system faults or malfunctions to determine cause and corrective action required

**B. SCADA**

- 1 . Recognize basic requirements, equipment, and configuration of SCADA/DCS systems

**C. Monitoring/DCS Systems**

- 1 . Apply procedures for microprocessor-based power monitoring and control systems

**D. Functional Testing**

- 1 . Employ methods and procedures for system-function tests upon completion of the individual component tests defined, as system conditions allow
- 2 . Apply concepts of functionality for electrical systems