The exam is an 8-hour open-book exam. It contains 40 multiple-choice questions in the 4-hour morning session, and 40 multiple-choice questions in the 4-hour afternoon session. Examinee works all questions.

The exam uses both the International System of units (SI) and the US Customary System (USCS).

The exam is developed with questions that will require a variety of approaches and methodologies, including design, analysis, and application. Some questions may require knowledge of engineering economics.

The knowledge areas specified as examples of kinds of knowledge are not exclusive or exhaustive categories.

The 2011 NEC® will be used for 1 year after the next NEC® version is issued.

### I. General Power Engineering

#### A. Measurement and Instrumentation

1. Instrument transformers
2. Wattmeters
3. VOM metering
4. Insulation testing
5. Ground resistance testing

#### B. Special Applications

1. Lightning and surge protection
2. Reliability
3. Illumination engineering
4. Demand and energy management/calculations
5. Engineering economics

#### C. Codes and Standards

1. National Electrical Code (NEC)
3. Electric shock and burns

### Approximate Percentage of Examination

- **I. General Power Engineering**: 30%
  - A. Measurement and Instrumentation: 7.5%
  - B. Special Applications: 10%
  - C. Codes and Standards: 12.5%

- **II. Circuit Analysis**: 20%
  - A. Analysis: 11%
    1. Three-phase circuit analysis
    2. Symmetrical components
    3. Per unit analysis
    4. Phasor diagrams
  - B. Devices and Power Electronic Circuits: 9%
    1. Battery characteristics and ratings
2. Power supplies  
3. Relays, switches, and PLCs  
4. Variable-speed drives

### III. Rotating Machines and Electromagnetic Devices 20%

#### A. Rotating machines 12.5%
1. Synchronous machines  
2. Induction machines  
3. Generator/motor applications  
4. Equivalent circuits  
5. Speed-torque characteristics  
6. Motor starting

#### B. Electromagnetic Devices 7.5%
1. Transformers  
2. Reactors  
3. Testing

### IV. Transmission and Distribution (High, Medium, and Low Voltage) 30%

#### A. System Analysis 12.5%
1. Voltage drop  
2. Voltage regulation  
3. Power factor correction and voltage support  
4. Power quality  
5. Fault current analysis  
6. Grounding  
7. Transformer connections  
8. Transmission line models

#### B. Power System Performance 7.5%
1. Power flow  
2. Load sharing: parallel generators or transformers  
3. Power system stability

#### C. Protection 10%
1. Overcurrent protection  
2. Protective relaying  
3. Protective devices (e.g., fuses, breakers, reclosers)  
4. Coordination