**THE NATIONAL COUNCIL OF EXAMINERS FOR ENGINEERING AND SURVEYING**
**PRINCIPLES AND PRACTICE OF ENGINEERING EXAMINATION**

# ELECTRICAL AND COMPUTER
# (Depth – Power)

**EFFECTIVE April 2002**

The electrical and computer engineering examination is a breadth and depth examination. This means that **all** examinees work the breadth (AM) exam and **one** of the three depth (PM) exams. The breadth exam contains questions from the general field of electrical and computer engineering. The depth exams focus more closely on a single area of practice in electrical and computer engineering. The three depth examinations are Computers; Electronics, Controls and Communications; and Power.

| **Power Depth Module (PM)** | Approximate Percentage of Examination |
|---|---|
| **I. General Power Engineering** | **15%** |
| A. Measurement, Instrumentation and Statistics | 5% |
| 1. Power Metering | |
| 2. Instrument Transformers | |
| 3. Transducers | |
| 4. Frequency Response of Measurement Devices | |
| 5. Data Evaluation | |
| 6. Reliability | |
| B. Special Applications | 2% |
| 1. Illumination Design | |
| 2. Lightning and Surge Protection | |
| C. Codes and Standards | 8% |
| 1. ANSI Standards | |
| 2. NEC (code) | |
| 3. IEEE Standards | |
| 4. NEMA Standards | |
| 5. NESC (code) | |
| **II. Circuit Analysis** | **28%** |
| A. Analysis | 15% |
| 1. Short Circuit Analysis | |
| 2. Wye-Delta Transformation | |
| 3. Three-Phase Circuit Analysis | |
| 4. Symmetrical Components | |
| 5. Balanced and Unbalanced Systems | |
| 6. Per Unit Analysis | |

| | Approximate Percentage of Examination |
|---|---|
| B. Devices and Power Electronic Circuits | 8% |
| 1. Solid State Power Device Characteristics and Ratings<br>2. Battery Characteristics and Ratings<br>3. Power Supplies<br>4. Relays and Switches<br>5. Power Electronics | |
| C. Electric and Magnetic Fields and Applications | 5% |
| 1. Transmission Line Models<br>2. Mechanical Forces Between Conductors<br>3. Electromagnetic Fields, Coupling, and Interference<br>4. Electrostatics<br>5. Ferroresonance | |
| **III. Rotating Machines and Electromagnetic Devices** | **27%** |
| A. Rotating Machines | 18% |
| 1. Synchronous Machines<br>2. Induction Machines<br>3. DC Machines<br>4. Machine Constants and Nameplate Data<br>5. Equivalent Circuits<br>6. Response Times<br>7. Speed-Torque Characteristics<br>8. Speed Control<br>9. Motor Starting<br>10. Variable Speed Drives<br>11. Testing | |
| B. Electromagnetic Devices | 9% |
| 1. Transformers<br>2. Reactors<br>3. Magnetic Circuit Theory<br>4. Testing | |
| **IV. Transmission and Distribution** | **30%** |
| A. System Analysis | 15% |
| 1. Voltage Drop and Voltage Regulation<br>2. Power Factor Correction<br>3. Parallel Three-Phase Systems<br>4. Surge Protection<br>5. Power Quality<br>6. Fault Current Analysis<br>7. Grounding<br>8. Resistance Grounding<br>9. Transformer Connections<br>10. Models | |

| | | Approximate Percentage of Examination |
|---|---|---|
| B. | Power System Performance | 6% |
| | 1. Load Flow<br>2. Models<br>3. Power System Stability<br>4. Voltage Profile<br>5. Computer Control and Monitoring | |
| C. | Protection | 9% |
| | 1. Overcurrent Protection<br>2. Protective Relaying<br>3. Protective Devices<br>4. Coordination | |
| | **TOTAL** | **100%** |

**NOTES:**

1. The knowledge areas specified under A, B, C, ... etc., are examples of kinds of knowledge, but they are not exclusive or exhaustive categories.

2. Each depth (PM) exam contains 40 multiple-choice questions. Examinee chooses **one** depth exam and works all questions in the depth exam chosen.