

National Council of Examiners for Engineering and Surveying

**Principles and Practice of Engineering Examination
Electrical and Computer—ELECTRICAL AND ELECTRONICS Exam Specifications
EFFECTIVE Beginning with the April 2009 Examinations**

	Approximate Percentage of Examination
I. General Electrical Engineering Knowledge	50%
A. Circuit Analysis	25%
1. Passive components	
2. DC circuits	
3. Sinusoidal analysis	
4. Transient analysis	
5. Power and energy calculations	
6. Battery characteristics and ratings	
7. Power supply	
B. Measurement and Instrumentation	10%
1. Transducer and system characteristics	
2. Data evaluation	
3. Operational amplifiers	
C. Safety and Design Limits	4%
1. Interface applications	
2. Failure limits and circuit protection	
3. Safety grounding	
4. Electromagnetic interference and exposure	
5. Reliability	
6. Electric shock and burns	
D. Signal Processing	11%
1. Sampling theory (aliasing, Nyquist sampling rate)	
2. Transforms and applications	
3. Analog-to-digital (A/D) and digital-to-analog (D/A) conversions	

II. Digital Systems	11%
A. Digital Logic	5%
1. Boolean algebra	
2. Combinational and sequential logic	
B. Digital Components	6%
1. Digital devices	
2. Memory devices	
3. Programmable logic devices	
4. Microcontrollers/embedded systems	
III. Electric and Magnetic Field Theory and Applications	9%
A. Electromagnetic Fields	4%
1. Theory	
2. EMI/EMC	
B. Transmission Lines and Guided Waves	2.5%
1. Transmission lines, balanced and unbalanced	
2. Waveguides	
C. Antennas	2.5%
1. Gain, patterns, and polarization	
2. Impedance	
IV. Electronics	12.5%
A. Electronic Circuit Theory	6.5%
1. Small-signal and large-signal models	
2. Active networks and filters	
3. Nonlinear circuits (e.g., comparators)	
4. Sinusoidal steady-state analysis	
5. Transient analysis	
6. Power and energy calculations	
B. Electronic Components and Circuits	6%
1. Solid-state power devices and power electronics applications	
2. Battery characteristics and ratings	
3. Power supplies	
4. Oscillators and phase-locked loop characteristics	
5. Amplifiers	
6. Modulators and demodulators	
7. Diodes	

8. Circuit protection and safety
9. Transistors and applications

V. Control System Fundamentals **7.5%**

- A. Block diagrams
- B. Characteristic equations
- C. Frequency response
- D. Time response
- E. Control system design and implementation (e.g., compensators, steady-state error)
- F. Stability (e.g., tests, Bode plots, root locus, transport delay)

VI. Communications **10%**

- A. Modulation 4%
 1. Analog modulation
 2. Digital modulation
 3. Spread spectrum modulation characteristics

- B. Noise and Interference 2%
 1. Signal-to-noise ratio
 2. Quantization noise
 3. Noise figure and temperature
 4. Interference
 5. Coding, error detection and correction

- C. Telecommunications 4%
 1. Wireline communications
 2. Wireless communications
 3. Optical communications
 4. Multiplexing
 5. Traffic and switching

Notes

1. 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.
2. The knowledge areas specified as examples of kinds of knowledge are not exclusive or exhaustive categories.
3. The exam contains 80 multiple-choice questions. Examinee works all questions.