Specific competencies and skills tested in this assessment:

**Overview of Engineering, Social, Environmental, and Ethics**
- Identify potential career opportunities related to engineering and technology
- Explain educational requirements and professional expectations associated with a chosen technical career path
- Explain the interaction between technological development and social change
- Explain a contemporary definition of engineering
- Describe the history and development of engineering
- Explain what engineers do
- Describe the principal fields of engineering specialization and identify associated career tracks
- Identify education requirements for engineer occupations and locations where programs of study are available
- Describe how external issues constrain the engineering design process
- Describe the social, economic, and environmental impacts of a technical process, product, or system

**Design Process/Problem Solving**
- Demonstrate fundamental principles of design
- Design and conduct experiments along with analysis and interpretation of data
- Identify and consider realistic constraints relevant to the design of a system, component, or process
- Describe the process of input, output, and feedback that comprise the universal systems model
- Demonstrate applications of the universal systems model across the spectrum of technologies
- Describe role of time, people, tools and machines, materials, information within the universal systems model
- Describe the role of mathematics and science in technological development
- Construct a mathematical model for a known technological system
- Explain the scientific principles behind a basic machine
- Explain the problem solving processes used by engineers, designers, and other technologists
- Create a solution to a given problem
- Test and evaluate a problem solution
- Describe role of problem identification, search, criteria, and communication as activities in the engineering design process
- Organize the interactive processes necessary to develop and optimize a design solution
- Apply engineering design to the solution of a problem
- Apply mathematical models and calculations necessary to complete predictive analysis
- Modify a design plan to accommodate unforeseen constraints
- Identify appropriate modeling techniques
- Evaluate effectiveness of prototyped solution and modify as needed
- Develop cost analysis and return on investment calculations
- Describe the core concepts of technology
- Prepare a report of engineering design activities, including analysis, optimization, and final solution
Engineering – continued

**Tools, Measurements and Materials**
- Identify appropriate modeling techniques
- Select and apply appropriate materials, tools, and processes for prototype development
- Use laboratory tools and equipment to determine the properties of materials
- Explain the criteria for selection of appropriate materials, tools, and processes
- Apply appropriate care and maintenance in the use of tools and machines
- Describe strategies for selecting materials and processes for developing a technical system or artifact
- Demonstrate fundamental materials processing and assembly techniques
- Apply analytical tools to the development of optimal solutions for technological problems
- Explain the criteria for selection of appropriate materials, tools, and processes
- Demonstrate techniques, skills, and knowledge necessary to use and maintain technical products and systems
- Demonstrate fundamental materials processing and assembly techniques

**Engineering Graphics**
- Demonstrate fundamentals of technical sketching
- Present a technical design using computer-generated visuals
- Use multi-view projection and pictorial drawings to communicate design specifications
- Apply described geometry and graphical vector analysis to the analysis of engineering design problems
- Apply accurate dimensions to a technical drawing, including size and geometric tolerances
- Prepare a proposal for an engineering design project
- Document engineering design processes using an engineering design notebook

**Safety**
- Safely and effectively manipulate materials, tools, and processes
- Apply appropriate care and maintenance in the use of tools and machines

**Engineering Systems**
- Describe the role of mathematics and science in technological development
- Construct a mathematical model for a known technological system
- Explain the scientific principles behind a basic machine
- Describe strategies, select materials and processes necessary to develop a technical system or artifact
- Evaluate interdependence of components in a technical system and identify elements critical to correct function
- Apply analytical tools to the development of optimal solutions for technological problems

**Teamwork, Leadership, and Interpersonal Relations**
- Explain engineer’s responsibility as a team member in design and development of technical products and processes
- Demonstrate team approach in applying engineering design to solution of a technological problem
- Demonstrate effective communication skills
- Demonstrate cooperation and understanding with persons who are ethnically and culturally diverse
- Work cooperatively in multi-disciplinary teams
- Demonstrate oral communication skills in reporting results of an engineering design activity
**Engineering – continued**

**Written Assessment:**

Administration Time: 1½ hours  
Number of Questions: 93

**Areas covered:**

- 11% Overview of Engineering, Social, Environmental and Ethics  
- 39% Design Process/Problem Solving  
- 19% Tools, Measurements and Materials  
- 9% Engineering Graphics  
- 4% Safety  
- 11% Engineering Systems  
- 7% Teamwork, Leadership and Interpersonal Relations

**Sample Questions:**

The boundary of a property is shown on a plot plan with a _____ line.

- A. hidden  
- B. center  
- C. break  
- D. phantom

Evaluation is an important step because

- A. it helps determine if the product is of value  
- B. it provides a cost analysis  
- C. the product can be sold based on the outcome  
- D. the product design is easier to reproduce after a good evaluation

Which of the following actions should be taken if a prototype power supply is running hot in a test within the enclosure?

- A. remove the power supply from its enclosure  
- B. redesign the circuit to increase the power drawn  
- C. place an auxiliary fan to blow across the enclosure  
- D. increase the fan capacity of the power supply
What type of coating is best on an outdoor catwalk made of low carbon steel and used in a refinery?

A. anodized  
B. galvanize  
C. oil based paint  
D. latex based paint

Which of the following is a critical component of an Automatic Vehicle Identification (AVI) system?

A. HOV lanes  
B. vehicle headlights  
C. AVI antennas  
D. interstate signs