

**TEST BOOKLET**  
**BOC 1013 – Smart Buildings Fundamentals**  
**Edition 1.00**

TEST INSTRUCTIONS

The test consists of 20 multiple choice questions. A period of 1 hour is available for the test, but it will not be strictly timed. This is an open book test. You may use any notes or handout materials of your own. You will work independently to answer the questions. Teaming up with a classmate is not permitted. Mark all answers only on the ANSWER SHEET. Make no marks in the TEST BOOKLET.

Select only one answer by circling the corresponding letter on the ANSWER SHEET. Where it appears that two answers may be correct, choose the one better answer. There are no questions that require the circling of more than one choice.

Below are some sample questions:

Example #1: Electric motors typically have an efficiency of approximately.

- A. 95% to 99%
- B. 78% to 93%
- C. 50% to 75%
- D. 40% to 48%

Standard motors are approximately 78% to 93% efficient, depending on size. High efficiency electric motors can have very high efficiencies, but even these special motors exceed 95% in only very large sizes. While there are specialized motors that can exceed 95%, this is not typical. The answer should be marked by drawing a circle around letter "B" on the ANSWER SHEET.

Example #2: In the past, asbestos fibers were commonly used in numerous building materials, including which of the following:

- A. Pipe Insulation
- B. Furnishings
- C. Window coverings, such as drapes
- D. All of the above.

While all three could have contained asbestos, it was commonly used in only one of these--pipe insulation. The answer should be marked by drawing a circle around letter "A" on the ANSWER SHEET.

Note: In the preceding example question, only pipe insulation was included as a material that commonly contained asbestos. That does not mean that only pipe insulation contained asbestos. It should be understood that the items covered in this test have been chosen to sample the operator's knowledge.



**BEGINNING OF TEST**  
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Mark all answers on *only* the ANSWER SHEET. Make *no* marks in the BOOKLET.

- 1. What makes the modern energy grid different from a traditional power grid?**
  - A. Central source of energy generation
  - B. One way power flow
  - C. Natural gas generation
  - D. Decentralized sources of power generation
  - E. None of the above
  
- 2. Which unique characteristic do Zero Energy buildings have that makes them different from standard buildings?**
  - A. Compliant with energy codes
  - B. Use of off-site renewable energy
  - C. Can offset their energy consumption with on-site renewable energy
  - D. Located in temperate climates
  - E. None of the above
  
- 3. Which of the following is NOT an example of IOT enabled smart building technology?**
  - A. Advanced Digital Lighting System
  - B. Plug Load Control
  - C. Automatic Irrigation Controller
  - D. Smart Window Shading System
  - E. None of the above
  
- 4. What is ASHRAE 90.1?**
  - A. National Mechanical Building Code
  - B. National Safety Standard
  - C. Efficiency rating system for appliances
  - D. An energy efficiency standard for commercial buildings
  - E. None of the above
  
- 5. Which of the following is NOT a characteristic of a Smart Building?**
  - A. Grid responsive
  - B. Integrated building systems
  - C. Semi-autonomous operation
  - D. On-site renewable energy
  - E. None of the above

6. **How much energy can a smart plug save in building energy use?**
- A. 10 - 15 percent
  - B. 50 - 60 percent
  - C. 40 - 70 percent
  - D. less than 20 percent
  - E. None of the above
7. **Which of the following attributes can be found in a smart lighting system?**
- A. Addressable devices
  - B. Standalone operation
  - C. Demand response control
  - D. Photocell control
  - E. A and C
8. **Daylight sensing is an advanced feature found in which of the following systems?**
- A. Smart HVAC
  - B. DER
  - C. Smart Meter
  - D. Smart lighting
  - E. None of the above
9. **How much energy use in commercial buildings is attributed to HVAC?**
- A. 10 - 15 percent
  - B. More than 60%
  - C. 20 percent
  - D. 40 percent
  - E. None of the above
10. **Which advanced feature does a Smart HVAC typically have?**
- A. Digital control
  - B. Computerized Graphics
  - C. Smart Thermostat
  - D. Automated fault detection
  - E. None of the above
11. **Smart Buildings utilize special software for data analytics and fault detection to accomplish which of the following?**
- A. Monitoring the HVAC system
  - B. Detecting abnormal conditions
  - C. Finding energy saving opportunities
  - D. Reporting system performance
  - E. All of the above
12. **A smart valve can be found in smart HVAC systems. Which of the following features is NOT considered smart technology in valves?**

- A. Three-way flow
  - B. Remote communication
  - C. Data logging
  - D. Flow sensing
  - E. None of the above
- 13. Which of the following system component has been found to be one of the most common point of failures in HVAC systems?**
- A. Damper actuators
  - B. Economizers
  - C. Sensors
  - D. Cooling coils
  - E. None of the above
- 14. How much energy waste is attributed to undetected faults and failures in building HVAC systems?**
- A. 10 - 15 percent
  - B. 30 - 50 percent
  - C. 60 - 80 percent
  - D. 5 - 30 percent
  - E. None of the above
- 15. Plug and process loads are significant sources of electrical consumption in commercial buildings. How much of the building's energy do these devices consume?**
- A. 70 percent
  - B. 20 percent
  - C. 60 percent
  - D. 33 percent
  - E. None of the above
- 16. Which of the following building energy loads are considered as Process and Plug Loads?**
- A. Ice machines
  - B. Electric boilers
  - C. Copiers
  - D. A and C
  - E. B and C
- 17. Which of the following benefits are attributed to the use of Smart Meters?**
- A. Remote meter validation and testing
  - B. Digital display
  - C. Energy data analytics
  - D. A and B
  - E. A and C

- 18. What does the term BACnet stand for?**
- A. Building Alternating Current Network
  - B. Building Automatic Control Network
  - C. Building Air Conditioning Network
  - D. Building Automation and Controls Network
  - E. None of the above
- 19. How many communication layers does the BACnet protocol utilize as part of its standard?**
- A. One
  - B. Two
  - C. Three
  - D. Four
  - E. None of the above
- 20. What are the four key characteristics of a Grid-interactive Efficient Building?**
- A. Efficient, sustainable, high performance, zero energy
  - B. Efficient, connected, smart, flexible
  - C. Zero energy, renewable energy, smart, green certified
  - D. Flexible, low power, integrated, smart
  - E. None of the above

**END OF TEST**

Please return the Test Booklet and your Answer Sheet to Administrator.