NCCER Instrumentation Certification Practice Test (Sample)

Study Guide

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Questions

1. The carbon content of steel with an SAE code number of 8720 is approximately what percentage?

A. 0.15 percent

B. 0.20 percent

C. 0.30 percent

D. 0.40 percent

2. Teflon tape is best used as which of the following due to its characteristics?

A. Adhesive

B. Lubricant

C. Sealant

D. Threading agent

3. Which of the following positioners may interface with a PAM program?

A. Standard Positioner

B. Electric Positioner

C. Intelligent Positioner

D. Pneumatic Positioner

4. The control variable is ultimately controlled by the ---- loop

A. feedback

B. controller

C. control

D. management

5. Reed relays are used in applications requiring all of the following characteristics except?

A. high current

B. compact design

C. low power consumption

D. fast operation

6. What is the carbon content range typically found in cast iron?

A. 1 to 2 percent

B. 2 to 4 percent

C. 4 to 6 percent

D. 0 to 1 percent

7. Which modules provide a high-speed counter external to the PLC processors?

A. Encoder/Counter

B. Analog Input

C. Discrete Output

D. Relay Modules

8. What are the three primary functions of a control valve?

A. Start, stop, control

B. Regulate, isolate, discharge

C. Open, close, adjust

D. Accelerate, deactivate, channel

9. What aspect of direct-operated regulators affects their control quality significantly?

A. Pressure regulation

B. Temperature sensitivity

C. Poor sensitivity

D. Flow dynamics

10. Which of the following measuring detectors applies a converging cone shaped inlet section?

A. venturi tube

B. orifice plate

C. rotameter

D. pitot tube

Answers

1. B
2. B
3. C
4. B
5. A
6. B
7. A
8. A
9. C
10. A

Explanations

1. The carbon content of steel with an SAE code number of 8720 is approximately what percentage?

A. 0.15 percent

B. 0.20 percent

C. 0.30 percent

D. 0.40 percent

The correct answer is that the carbon content of steel with an SAE code number of 8720 is approximately 0.20 percent. The SAE (Society of Automotive Engineers) classification system provides a way to identify the chemical composition of steel and its properties. In this particular coding format, the first two digits indicate the primary alloying elements, while the last two digits represent the approximate carbon content as a percentage multiplied by 100. In the case of 8720, the '20' at the end indicates that the carbon content is around 0.20 percent. It's important to note that the figures associated with these codes represent a range – thus, the exact carbon percentage can vary slightly depending on specific manufacturing practices and tolerances, but 0.20 percent is a standard approximation for this classification. Understanding this numbering and its implications is crucial for selecting the right steel for applications in engineering and construction, highlighting the importance of material properties in instrumentation and other fields.

2. Teflon tape is best used as which of the following due to its characteristics?

A. Adhesive

B. Lubricant

C. Sealant

D. Threading agent

Teflon tape is primarily used as a sealant because of its unique properties. It is designed to form a tight seal on threaded pipe connections, preventing leaks of gases and liquids. The tape is non-adhesive and works effectively under a variety of temperatures and pressures, making it suitable for plumbing and gas fittings. Its smooth surface allows for easier disassembly while also providing a reliable seal during operation. The character of Teflon tape, specifically, its ability to expand and fill gaps between threaded surfaces, is why it is favored as a sealing material. While it does have some lubricating properties, its primary function in the context of instrumentation and piping systems is to act as a sealant, ensuring a leak-proof connection.

3. Which of the following positioners may interface with a PAM program?

A. Standard Positioner

B. Electric Positioner

C. Intelligent Positioner

D. Pneumatic Positioner

The intelligent positioner is designed with advanced capabilities that allow it to communicate with higher-level systems such as Process Automation and Management (PAM) programs. This type of positioner typically has built-in diagnostics, self-tuning features, and the ability to process data, which enables it to integrate seamlessly with PAM systems. Intelligent positioners can transmit and receive data, making them ideal for applications that require more than basic actuation control. They allow for real-time data exchange and can help optimize performance and increase reliability within a control loop. This advanced functionality is essential for modern process control environments, where data-driven decision-making is crucial. In contrast, standard, electric, and pneumatic positioners do not possess these communication capabilities or advanced features. They primarily operate based on direct control signals without the integration needed for effective interaction with PAM programs. Hence, while they might serve their intended purposes in typical applications, they lack the critical interfacing abilities that intelligent positioners provide.

4. The control variable is ultimately controlled by the ---- loop

A. feedback

B. controller

C. control

D. management

The control variable is ultimately controlled by the controller loop because the controller is responsible for processing the input from sensors, comparing it to the desired setpoint, and then making adjustments to the control element to maintain the desired process condition. In a control system, the controller operates based on algorithms and control strategies to ensure that the output remains at the setpoint despite any disturbances or changes in the system. This interaction is essential in various applications, such as temperature control, pressure regulation, or flow control, where the controller continuously monitors the process variable and makes the necessary adjustments to the control variable. By effectively managing these adjustments, the controller ensures that the overall system remains stable and operates within the desired parameters.

5. Reed relays are used in applications requiring all of the following characteristics except?

A. high current

B. compact design

C. low power consumption

D. fast operation

Reed relays are electromagnetic switching devices that are known for their compact design, low power consumption, and fast operation. These characteristics make them suitable for various applications, particularly where space-saving and efficiency are critical. Reed relays typically function by closing or opening contacts through the magnetic field created when current flows through a coil, enabling quick switching times and minimal power usage when in operation. However, reed relays are not designed to handle high current loads. They are generally used in low current applications, typically in the milliamp range, due to their construction and the materials used in the reed switch. When exposed to high currents, the contacts can weld together, leading to failure. Thus, while providing many advantages for specific applications, reed relays are not the ideal choice for situations requiring high current capabilities, making it clear that high current is not one of their intended characteristics.

6. What is the carbon content range typically found in cast iron?

A. 1 to 2 percent

B. 2 to 4 percent

C. 4 to 6 percent

D. 0 to 1 percent

Cast iron is defined by its carbon content, which typically ranges from 2 to 4 percent. This range is significant because the presence of carbon influences the material properties of cast iron, such as its hardness, fluidity, and castability. The higher carbon content in cast iron, compared to other types of iron or steel, allows it to be melted and poured into molds, making it ideal for various casting applications. Within this carbon range, cast iron can also contain other elements, such as silicon, which further enhances its properties and the formation of graphite structures during its solidification. These graphite structures contribute to cast iron's unique characteristics, such as its excellent machinability and wear resistance, making it a preferred material for engine blocks, pipes, and other durable applications. The other ranges do not accurately represent the carbon content found in cast iron. While lower carbon content can be found in wrought iron, it does not qualify as cast iron. A significantly higher carbon content would lead to other materials, such as pig iron. Thus, the carbon content in cast iron specifically falls between 2 to 4 percent, confirming its classification and usage in various industrial applications.

7. Which modules provide a high-speed counter external to the PLC processors?

A. Encoder/Counter

B. Analog Input

C. Discrete Output

D. Relay Modules

High-speed counters are crucial for applications that require precise measurement and control of high-speed events, such as in motion control systems. The Encoder/Counter modules are designed specifically for this purpose. They can process input signals from encoders and other high-speed devices, allowing them to count pulses and provide feedback to the PLC regarding position, speed, and direction. These modules can handle much faster input signals than the standard processing capabilities of many PLC processors, which is essential in scenarios where rapid events occur, such as counting the revolutions of a motor or monitoring fast-moving equipment. This capability enables the PLC system to operate more effectively, ensuring accurate data collection and response in real-time applications. In contrast, the other options focus on different functions: Analog Input modules deal with continuous signals, Discrete Output modules handle binary on/off outputs, and Relay Modules are utilized for switching high-power devices rather than high-speed counting. Therefore, recognizing the specialized function of Encoder/Counter modules illustrates their critical role in managing high-speed input efficiently.

8. What are the three primary functions of a control valve?

A. Start, stop, control

B. Regulate, isolate, discharge

C. Open, close, adjust

D. Accelerate, deactivate, channel

The primary functions of a control valve are to start, stop, and control the flow of fluids within a system. These functions are essential in managing the process variables such as flow rate, pressure, and temperature. Starting and stopping the flow is crucial for operational safety and efficiency, allowing operators to manage system processes effectively. Control involves adjusting the flow rate to achieve desired process conditions. By enabling precise control over the amount of fluid passing through, control valves can maintain the desired operating conditions in various applications. In contrast, other options do not comprehensively cover the main roles of a control valve. While regulating, isolating, and discharging may relate to different aspects of valve types or systems, they do not encapsulate the foundational control functions. Additionally, terms like "accelerate," "deactivate," and "channel" are more general and not specifically applicable to the functionalities of control valves in the manner required to accurately describe their primary role.

9. What aspect of direct-operated regulators affects their control quality significantly?

A. Pressure regulation

B. Temperature sensitivity

C. Poor sensitivity

D. Flow dynamics

The control quality of direct-operated regulators is significantly affected by their sensitivity, particularly in the context of how accurately and promptly they respond to pressure changes. High sensitivity in these regulators enables them to detect even minor fluctuations in pressure and adjust the valve position accordingly to maintain the desired output pressure. If the sensitivity is poor, the regulator may not respond adequately to pressure variations, leading to instability and erratic performance. This results in suboptimal control quality because the regulator is unable to maintain steady and precise pressure levels over time. Other factors, like pressure regulation, temperature sensitivity, and flow dynamics, play a role in the overall functioning of regulators but may not directly impact the immediate responsiveness and control quality as dramatically as sensitivity does. For example, while temperature sensitivity can influence how a regulator performs under varying thermal conditions, its fundamental ability to accurately regulate pressure hinges more on its sensitivity. Therefore, poor sensitivity is a critical aspect that directly influences the control quality, making it essential for effective regulation.

10. Which of the following measuring detectors applies a converging cone shaped inlet section?

A. venturi tube

B. orifice plate

C. rotameter

D. pitot tube

The venturi tube utilizes a converging cone-shaped inlet section to measure the flow rate of fluids. This design works based on the principle of conservation of energy and Bernoulli's equation. As the fluid enters the venturi tube, it is forced to flow into a narrower section, causing the velocity of the fluid to increase while the pressure decreases. By measuring the pressure difference between the wider and narrower sections of the tube, one can determine the flow rate. This shape is crucial because it helps in reducing turbulence as the fluid accelerates, leading to more accurate measurements. The other devices mentioned, while they are also used for flow measurements, do not feature a converging cone-shaped inlet section. The orifice plate creates a sharp drop in pressure but does not have a converging section; it simply allows flow through a hole or "orifice," causing a pressure differential that can be measured. The rotameter uses a tapered tube to measure flow but does not employ a converging cone shape; instead, it relies on a float that rises in response to flow rate. The pitot tube measures fluid velocity using static and dynamic pressure, but it does not have a converging inlet; it has an opening that captures the flow to measure pressure