2nd Year Lineman Apprentice Practice Exam (Sample)

Study Guide

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Questions

1. What type of joint involves twisting conductors together with tools?

A. Sleeve joint

B. Splice joint

C. Twisted joint

D. Compression joint

2. In a right triangle with a hypotenuse length of 746 feet and one side measuring 524 feet, what is the length of the other side?

A. 200 feet

B. 531 feet

C. 630 feet

D. 520 feet

3. What do spring-loaded wedges in a joint primarily provide?

A. Electrical isolation

B. Mechanical tension

C. Conductivity enhancement

D. Corrosion resistance

4. What is another name for "annealed" wire?

A. Soft drawn

B. Hard drawn

C. Semi-stranded

D. Rigid

5. What feature is typically found in a transformer rated at 240/120?

A. Two bushings

B. Four bushings

C. Center tap not split

D. Delta connection only

6. What is the current flow in a series circuit with three resistors rated at 5 ohms, 10 ohms, and 15 ohms, and a circuit voltage of 240 volts?

A. 4 amps

B. 6 amps

C. 8 amps

D. 10 amps

7. What is the ratio of breaking strength to safe working load of a rope?

A. 2 to 1

B. 3 to 1

C. 4 to 1

D. 5 to 1

8. What is the primary use of a guard structure in power-line work?

A. To attach hot sticks

B. To protect from falling conductors

C. To maintain conductor tension

D. To conduct electricity

9. What elementary particle of an atom is positive in charge?

A. Neutron

B. Electron

C. Proton

D. Ion

10. How is electrical energy generated from mechanical energy?

A. Using a transformer

B. Using an inverter

C. Using a generator

D. Using a capacitor

Answers

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

Explanations

1. What type of joint involves twisting conductors together with tools?

A. Sleeve joint

B. Splice joint

C. Twisted joint

D. Compression joint

The type of joint that involves twisting conductors together with tools is referred to as a twisted joint. This method is commonly used in electrical work to create a solid and reliable connection between two or more conductors. By twisting the wires together, you create a mechanical bond that can withstand a certain amount of stress and movement, which is crucial in many electrical applications. Additionally, tools such as pliers may be used to ensure the twist is tight and secure, enhancing the connection's strength. The twisted joint is particularly effective for low-voltage applications and is often used in residential wiring, making it a staple in the toolkit of linemen and electricians. Understanding how to make a twisted joint properly can influence the reliability of the electrical connection, making it a vital skill for linemen apprentices.

2. In a right triangle with a hypotenuse length of 746 feet and one side measuring 524 feet, what is the length of the other side?

A. 200 feet

B. 531 feet

C. 630 feet

D. 520 feet

In a right triangle, the relationship among the lengths of the sides is defined by the Pythagorean theorem. This theorem states that the sum of the squares of the two legs (the sides forming the right angle) is equal to the square of the hypotenuse (the side opposite the right angle). In this case, the length of the hypotenuse is provided as 746 feet, and one of the legs is given as 524 feet. To find the length of the other side, we can set up the equation based on the Pythagorean theorem: Let the length of the unknown side be denoted as x. The equation can be formulated as follows: $524^2 + x^2 = 746^2$ Calculating the squares: - For the hypotenuse: $746^2 = 556756$ - For the known side: $524^2 = 274576$ Now substituting these values into the Pythagorean theorem equation: $274576 + x^2 = 556756$ To isolate x^2, we need to subtract 274576 from both sides: x^2

3. What do spring-loaded wedges in a joint primarily provide?

A. Electrical isolation

B. Mechanical tension

C. Conductivity enhancement

D. Corrosion resistance

Spring-loaded wedges in a joint are designed to provide mechanical tension, which is crucial for maintaining a secure and reliable electrical connection. These wedges work by applying a consistent force on the conductors within the joint. This force helps to keep the conductors tightly pressed together, ensuring that there is minimal resistance at the connection point. The tension created by the spring-loaded design compensates for any thermal expansion or contraction that might occur due to changing temperatures, thus preventing loosening of the joint over time. This mechanical tension is essential not only for the integrity of the connection but also for maintaining optimal electrical performance, as a loose connection can lead to increased resistance and potential overheating. In addition, while spring-loaded wedges contribute to the overall stability of the connection, other options such as electrical isolation, conductivity enhancement, or corrosion resistance are not their primary functions. Those characteristics might be achieved through different means or materials in the joint design, but the spring-loaded wedges specifically focus on creating and maintaining mechanical tension.

4. What is another name for "annealed" wire?

A. Soft drawn

B. Hard drawn

C. Semi-stranded

D. Rigid

Annealed wire is known for its increased ductility and lower hardness, which makes it more pliable and easier to work with. The term "soft drawn" is used to describe wire that has undergone the annealing process, during which it is heated and then slowly cooled. This process relieves internal stresses and makes the wire softer compared to hard drawn wire, which retains its hardness and tensile strength but is less flexible. The soft drawn characteristic is essential in applications where flexibility and bending are necessary, such as electrical installations and various fabrication tasks. Hence, the use of the term "soft drawn" aligns directly with the properties that annealed wire exhibits.

5. What feature is typically found in a transformer rated at 240/120?

A. Two bushings

B. Four bushings

C. Center tap not split

D. Delta connection only

A transformer rated at 240/120 volts typically features a center-tap configuration on the lower voltage side, which allows it to provide two 120-volt outputs that are 180 degrees out of phase with each other. This center tap serves as the neutral point for the 120-volt circuits, making it possible to tap into this transformer for standard household voltage requirements while also providing a higher voltage output when needed. The presence of this center tap is essential in residential applications, where both 120-volt and 240-volt circuits are common. It allows for versatility in power distribution, accommodating various electrical loads efficiently. The other options, while they relate to transformers, do not specifically address the common feature of a 240/120 transformer. For instance, having two or four bushings is not a defining feature of this voltage rating but relates to the design and configuration of specific transformers. Similarly, a delta connection refers to a specific type of winding arrangement that is not exclusively associated with transformers rated at 240/120 volts. A center tap not being split is critical because it distinguishes the configuration needed for standard residential or light commercial electrical systems.

6. What is the current flow in a series circuit with three resistors rated at 5 ohms, 10 ohms, and 15 ohms, and a circuit voltage of 240 volts?

A. 4 amps

B. 6 amps

C. 8 amps

D. 10 amps

To determine the current flow in a series circuit, you first need to find the total resistance. In a series circuit, the total resistance is simply the sum of the individual resistances. Here, you have three resistors with values of 5 ohms, 10 ohms, and 15 ohms. Calculating the total resistance: $$ Total\ Resistance = 5\ ohms + 10\ ohms + 15\ ohms = 30\ ohms $$ Once you have the total resistance, you can apply Ohm's Law, which states: $$ I = \frac{V}{R} $$ Where I is the current, V is the voltage, and R is the total resistance. Given that the circuit voltage is 240 volts, you can now calculate the current: $$ I = \frac{240\ volts}{30\ ohms} = 8\ amps $$ This calculation shows that the current flowing through the circuit is 8 amps. This is why the correct answer is the option that corresponds to 8 amps.

7. What is the ratio of breaking strength to safe working load of a rope?

A. 2 to 1

B. 3 to 1

C. 4 to 1

D. 5 to 1

The ratio of breaking strength to safe working load of a rope is an important safety measure in rigging and lifting operations. The breaking strength is the maximum amount of load that a rope can bear before it breaks, while the safe working load is the maximum load that can be applied to a rope during normal use without risk of failure. A commonly accepted safety standard in the industry states that the ratio of breaking strength to safe working load should be at least 5 to 1. This means that the rope's breaking strength should be at least five times greater than the maximum load it will carry in a safe working environment. This buffer allows for variations in load and conditions, such as dynamic loading, rope wear, and environmental factors, to reduce the risk of catastrophic failure. When choosing a rope for any application, adhering to this 5 to 1 ratio helps ensure safety and reliability. It is crucial for linemen and others working with ropes to be aware of these ratios to prevent accidents and injuries.

8. What is the primary use of a guard structure in power-line work?

A. To attach hot sticks

B. To protect from falling conductors

C. To maintain conductor tension

D. To conduct electricity

The primary use of a guard structure in power-line work is to protect from falling conductors. These structures are strategically placed to ensure safety by providing a physical barrier or reinforcement that prevents conductors from falling onto areas where personnel or equipment may be present. This is especially crucial during maintenance or repair work where the integrity of overhead lines is critical. By using guard structures, crews can minimize the risks associated with accidental contact with low-hanging or downed power lines, thus enhancing overall safety on the job site. In contrast, while attaching hot sticks and maintaining conductor tension are essential functions in line work, they do not align with the primary purpose of guard structures. Additionally, conducting electricity is a function related to the conductors themselves, not the guard structures that support safety measures. This distinction helps clarify the role of guard structures in preventing accidents and ensuring a safe working environment for linemen.

9. What elementary particle of an atom is positive in charge?

A. Neutron

B. Electron

C. Proton

D. Ion

The elementary particle of an atom that carries a positive charge is the proton. Protons are found within the nucleus of an atom, along with neutrons, and they play a crucial role in defining the atomic structure and properties of elements. The number of protons in the nucleus determines the atomic number of an element, which ultimately defines what element it is. In contrast to protons, neutrons are neutral particles, meaning they have no charge at all. Electrons, which orbit the nucleus, carry a negative charge. An ion is not a specific particle but rather an atom or molecule that has gained or lost one or more electrons, resulting in a net charge. Understanding these distinctions is essential in grasping the basic structure of atoms and their behavior in chemical reactions.

10. How is electrical energy generated from mechanical energy?

A. Using a transformer

B. Using an inverter

C. Using a generator

D. Using a capacitor

Electrical energy is generated from mechanical energy primarily through the use of a generator. A generator converts mechanical energy into electrical energy by utilizing the principle of electromagnetic induction. When a conductor, such as a coil of wire, moves through a magnetic field or when a magnetic field moves relative to the conductor, an electrical current is induced in the conductor. This process is fundamental in power generation systems, where mechanical energy from sources like wind, water, or steam is transformed into usable electrical energy. In contrast, while transformers, inverters, and capacitors play important roles in electrical systems, they do not directly convert mechanical energy into electrical energy. Transformers are used to change voltage levels in an existing electrical system, inverters convert direct current (DC) into alternating current (AC), and capacitors store and release electrical energy. Therefore, the generator is the correct answer, as it specifically fulfills the function of converting mechanical energy into electrical energy.