Northeastern Apprenticeship and Training (NEAT) 3-1 Practice Test (Sample)

Study Guide

Everything you need from our exam experts!

Questions

1. How long should a capacitor be allowed to discharge before grounding?

A. 1 minute

B. 3 minutes

C. 5 minutes

D. 10 minutes

2. The voltage across a wye connected transformer coil is what fraction of the line-to-line voltage on the wye system?

A. 50%

B. 58%

C. 70%

D. 80%

3. In a delta system, how does line current relate to phase current?

A. It is half of the phase current

B. It is equal to the phase current

C. It is 1.73 times the phase current

D. It is double the phase current

4. Which type of capacitor has a larger capacity for its size?

A. Oil filled

B. Ceramic

C. Electrolytic

D. Film

5. In an open transformer bank, the capacity is reduced to what percentage of the combined KVA ratings?

A. 76.7%

B. 86.6%

C. 93.5%

D. 100%

6. Which type of capacitor allows for adjustment of the distance between plates?

A. Variable type

B. Fixed type

C. Trimmer type

D. Electrolytic type

7. True or False: In the construction industry, the products from one market compete with products from another market.

A. True

B. False

C. Not applicable

D. Depends on the market

8. Oil filled capacitors typically have a lower capacity compared to electrolytic capacitors, but they possess a higher?

A. Temperature rating

B. Current rating

C. Voltage rating

D. Frequency response

9. How is the trade most commonly learned by apprentices?

A. In a classroom setting

B. On the job

C. By reading manuals

D. Through online courses

10. What must fixed capacitor banks be energized with?

A. Fused disconnect switches

B. Circuit breakers

C. Voltage regulators

D. Manual switches

Answers

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

Explanations

1. How long should a capacitor be allowed to discharge before grounding?

A. 1 minute

B. 3 minutes

C. 5 minutes

D. 10 minutes

A capacitor should typically be allowed to discharge for at least 5 minutes before it is grounded. This duration is important for ensuring safety, as capacitors can retain a charge even after power is removed from a circuit. The discharging process helps to minimize the risk of electric shock or damage to equipment when handling the capacitor. Grounding a capacitor too soon can pose hazards since a residual charge may still exist. Allowing a longer discharge time, such as 5 minutes, helps to ensure that the voltage across the capacitor has dropped to a safe level. Additionally, depending on the capacitor type and its capacitance, longer discharge times might be justified. As a general rule of thumb in electrical work, following the recommended wait time before grounding maximizes safety practices in handling stored electrical energy.

2. The voltage across a wye connected transformer coil is what fraction of the line-to-line voltage on the wye system?

A. 50%

B. 58%

C. 70%

D. 80%

In a wye (Y) connected transformer configuration, the relationships between line-to-line voltage and phase voltage are well-defined. The phase voltage, which is the voltage across each coil of the transformer, is actually a fraction of the line-to-line voltage. To understand this in terms of their mathematical relationship, consider that in a balanced three-phase system, the line-to-line voltage is equal to the square root of three times the phase voltage. Specifically, the formula is: Line-to-line voltage = √3 × Phase voltage. This implies that the phase voltage can be derived from the line-to-line voltage using the equation: Phase voltage = Line-to-line voltage / √3. When you calculate the fraction, you'll find that phase voltage is approximately 0.577 times the line-to-line voltage, or around 58%. This is why the correct answer indicates that the voltage across a wye connected transformer coil is 58% of the line-to-line voltage on the wye system, aligning well with the principles of three-phase electrical systems.

3. In a delta system, how does line current relate to phase current?

A. It is half of the phase current

B. It is equal to the phase current

C. It is 1.73 times the phase current

D. It is double the phase current

In a delta system configuration, the relationship between line current and phase current is defined by the fact that each line current is equal to the square root of 3 (approximately 1.73) times the phase current. This occurs because, in a delta connection, each line is connected to two phases, and the current flowing in the lines is the combination of the phase currents. When you examine the geometry of the current flow in a delta system using phasor diagrams, the line currents are influenced by the superposition of the phase currents. Since the phase currents are out of phase with each other by 120 degrees, the vector sum leads to the line current being greater than each individual phase current. Specifically, the relationship is expressed mathematically as: Line Current = √3 × Phase Current Thus, the correct understanding of this relationship is crucial for applications involving delta connections, as it impacts how load calculations and current ratings are approached for equipment and conductors in these systems.

4. Which type of capacitor has a larger capacity for its size?

A. Oil filled

B. Ceramic

C. Electrolytic

D. Film

Electrolytic capacitors are known for their high capacitance values relative to their size, making them a popular choice in applications where space is limited but a significant amount of capacitance is required. This ability stems from their construction, which typically involves a thin oxide layer serving as the dielectric and a liquid or gel electrolyte that acts as one of the plates. This design allows for a larger surface area within a compact volume, resulting in a greater amount of capacitance compared to other types of capacitors, such as oil-filled, ceramic, or film capacitors. In contrast, other types of capacitors have different properties and uses. Oil-filled capacitors, while robust, generally have lower capacitance values for their size because of the insulating oil they contain and their larger construction to accommodate it. Ceramic capacitors tend to have lower capacitance for their size, particularly in smaller values, although they can provide stability and reliability in circuits. Film capacitors, while useful in specific applications due to their stability and low losses, usually have lower capacitance compared to electrolytic capacitors when considering size. Thus, the unique structure and materials of electrolytic capacitors enable them to achieve higher capacitance in a compact form, making them ideal for many electronic applications

5. In an open transformer bank, the capacity is reduced to what percentage of the combined KVA ratings?

A. 76.7%

B. 86.6%

C. 93.5%

D. 100%

The capacity of an open transformer bank is impacted by the configuration and operation of the transformers. In an open bank, typically one transformer is taken out of service for maintenance or replacement, which affects the overall capacity you can safely utilize. When calculating the effective capacity of an open bank, it is known that the capacity is reduced to approximately 86.6% of the total combined KVA ratings of the transformers in the bank. This percentage is derived from the understanding that, in a three-phase system, if one transformer is removed, the current is redistributed among the remaining transformers, and some balancing loss occurs. This results in a reduction in overall capacity due to the lack of full-load sharing and the fact that the transformers may not be able to handle the same loads without overheating or stressing them. Thus, in practical applications, 86.6% reflects a safe operating level while still allowing for adequate functionality during maintenance or unexpected outages. In contrast, the other options represent either higher or significantly lower capacities that do not align with standard practices for operating an open transformer bank configuration.

6. Which type of capacitor allows for adjustment of the distance between plates?

A. Variable type

B. Fixed type

C. Trimmer type

D. Electrolytic type

The trimmer type capacitor allows for the adjustment of the distance between its plates, which in turn changes its capacitance. This type of capacitor is specifically designed to fine-tune circuits by enabling small adjustments after the initial setup. Trimmer capacitors often have a mechanical adjustment mechanism, such as a screw or slider, that enables precise manipulation of the capacitor's value to achieve optimal circuit performance. In contrast, a fixed type capacitor has a set capacitance value determined during manufacturing and cannot be adjusted. It serves as a reliable component for applications where specific capacitance is needed without alteration. A variable type capacitor, while adjustable, typically operates on a different principle—such as overlapping plates—rather than changing the distance between them. Lastly, an electrolytic capacitor is designed for a specific range of capacitance but does not allow for distance adjustment either, as it is polarized and optimized for stable operation at its rated capacitance.

7. True or False: In the construction industry, the products from one market compete with products from another market.

A. True

B. False

C. Not applicable

D. Depends on the market

In the construction industry, the assertion that products from one market compete with products from another market is not generally accurate. Each market within the construction industry tends to focus on specific types of products or services that meet particular needs or requirements, thereby creating a more specialized environment where competition is typically confined to similar products or services. For example, the market for residential construction materials, such as lumber and roofing, competes within its own category, while the market for commercial construction materials may focus on different specifications and standards. The distinction between these markets means that products are often not directly in competition with each other due to their differing applications, target audiences, and project requirements. Therefore, the statement is false, as it implies a broader competition that does not usually exist in practice.

8. Oil filled capacitors typically have a lower capacity compared to electrolytic capacitors, but they possess a higher?

A. Temperature rating

B. Current rating

C. Voltage rating

D. Frequency response

Oil-filled capacitors are known for their ability to handle higher voltages compared to electrolytic capacitors. This characteristic is often attributed to the insulating properties of the oil, which provides excellent dielectric strength, allowing the capacitor to operate safely at elevated voltage levels without breaking down. This makes oil-filled capacitors particularly valuable in applications where high voltage stability is essential, such as in power transmission and distribution systems. In contrast, while electrolytic capacitors are designed for higher capacitance values and are often used in applications requiring substantial energy storage, they typically have lower voltage ratings, making them more susceptible to failure if exposed to voltages above their rated limits. Hence, the advantage of oil-filled capacitors in terms of voltage rating highlights their robust performance in demanding electrical environments.

9. How is the trade most commonly learned by apprentices?

A. In a classroom setting

B. On the job

C. By reading manuals

D. Through online courses

The trade is most commonly learned by apprentices on the job because this method provides hands-on experience, which is crucial in many skilled trades. Learning directly in the work environment allows apprentices to apply theoretical knowledge in real-world situations. They develop practical skills under the guidance of experienced professionals through direct participation and observation. This immersive approach enables apprentices to gain a deeper understanding of their trade, troubleshoot problems in real time, and become proficient through repetition and practice. Other methods, such as classroom instruction or reading manuals, may supplement their education but do not replace the invaluable experience gained on the job.

10. What must fixed capacitor banks be energized with?

A. Fused disconnect switches

B. Circuit breakers

C. Voltage regulators

D. Manual switches

Fixed capacitor banks must be energized with fused disconnect switches because these switches provide a critical safety mechanism to protect the electrical system. Fused disconnect switches are designed to isolate electrical circuits while also offering overcurrent protection. This is particularly important for capacitor banks as they can draw significant current under fault conditions, and the fuses will safely interrupt the circuit to prevent equipment damage and maintain system integrity. In contrast, while circuit breakers and manual switches can be used for control and isolation, they may not inherently provide the same level of protection from overcurrent or fault conditions that fused disconnect switches do. Voltage regulators are not relevant in this context, as their primary function is to maintain voltage levels rather than serve as isolation devices for capacitor banks. Hence, the choice of using fused disconnect switches is the most appropriate for ensuring safe operation of fixed capacitor banks.