Session 3

Class 1 on Lightening Arrestors/Surge Arrestors

A lab session on Lightning Arresters/Surge Arresters aims to provide practical experience and understanding of these devices used to protect electrical systems from lightning-induced surges. Here's a step-by-step guide for conducting a lab session on Lightning Arresters/Surge Arresters:

Introduction: Begin by explaining the purpose and importance of lightning arresters/surge arresters in electrical systems. Discuss the types of surges that can occur, such as lightning-induced surges and switching surges, and their potential impact on electrical equipment.

Lightning Arrester Basics: Provide an overview of lightning arresters/surge arresters, including their construction, operation principles, and the types commonly used, such as gap-type arresters, metal-oxide arresters, or silicon-carbide arresters. Explain the role of the arrester in diverting the surge current to ground and protecting the equipment.

Lab Setup: Set up a simulated electrical system model with various equipment, such as transformers, generators, transmission lines, and distribution feeders. Install lightning arresters/surge arresters at appropriate locations in the system, considering their ratings and application requirements.

Surge Current Testing: Demonstrate the generation of surge currents using surge generators or simulators. Inject lightning-induced surges or switching surges into the system and observe the behavior of the lightning arresters/surge arresters. Analyze their response in terms of diverting the surge current to ground and protecting the connected equipment.

Voltage Measurement: Use suitable voltage measurement instruments, such as digital multimeters or oscilloscopes, to measure the voltage across the equipment and the surge arresters. Compare the voltage levels before and after the arresters to evaluate their effectiveness in limiting the voltage surges.

Surge Arrester Selection: Discuss the factors to consider when selecting surge arresters, such as voltage rating, energy-handling capability, and coordination with other protective devices. Highlight the importance of properly matching the arrester characteristics to the system requirements.

Maintenance and Testing: Demonstrate the maintenance procedures associated with surge arresters, such as visual inspection, cleaning, and torque verification of connections. Explain the importance of periodic testing, such as insulation resistance testing and follow-up surge current testing, to ensure the continued effectiveness of the arresters.

Surge Arrester Replacement: Discuss the circumstances that may require surge arrester replacement, such as aging, excessive surge exposure, or failure during testing. Show participants the proper procedure for safely replacing surge arresters, including isolation, disconnection, and installation.

Documentation and Analysis: Document the observed results, including surge current magnitudes, voltage measurements, and the overall performance of the lightning arresters/surge arresters. Encourage participants to analyze the data and discuss the effectiveness of the surge protection provided by the arresters.

Q&A and Discussion: Conclude the lab session with a question-and-answer session and open discussion. Address any queries or concerns raised by the participants and encourage them to share their experiences and insights related to lightning arresters/surge arresters.

Throughout the lab session, prioritize safety by following appropriate protocols and guidelines for working with electrical systems and equipment. Emphasize the importance of understanding the role of lightning arresters/surge arresters in protecting electrical systems from surges and ensuring the safety and reliability of the equipment.

Class 2 on Isolators And Insulators,

A lab session on isolators and insulators aims to provide hands-on experience and understanding of these essential components used in electrical systems. Here's a step-by-step guide for conducting a lab session on isolators and insulators:

Introduction: Begin the lab session with an overview of isolators and insulators. Explain their role in electrical systems, the differences between the two, and their significance in ensuring the safe and reliable operation of the equipment.

Isolators:

a. Construction and Components: Demonstrate the construction of isolators, including the main components such as the insulating support structure, rotating blades or contacts, and the operating mechanism. Explain the different types of isolators, such as air-break isolators and load-break isolators.

b. Operation: Show participants how to operate the isolators using the appropriate operating mechanism. Explain the purpose of isolators in de-energizing and isolating equipment or sections of the electrical system for maintenance or repairs.

c. Safety Measures: Emphasize the importance of safety when working with isolators. Discuss the proper procedures for isolator operation, including visual inspections, verifying isolation, and following lockout/tagout protocols.

Insulators:

a. Insulator Types: Introduce different types of insulators, such as porcelain insulators, composite insulators, and glass insulators. Explain their construction, materials used, and the factors influencing their selection, such as voltage ratings and environmental conditions.

b. Electrical Insulation Testing: Demonstrate electrical insulation testing of insulators using a megohmmeter or insulation resistance tester. Show participants how to measure insulation resistance and discuss the significance of maintaining high insulation resistance for proper functionality.

c. Pollution Performance: Discuss the impact of environmental pollution on insulator performance. Show participants how to assess the pollution performance of insulators using a pollution severity test, if possible. Explain the necessity of maintaining clean and dry insulator surfaces for optimal insulation properties.

Hands-on Exercises:

a. Isolator Operation: Allow participants to operate selected isolators under controlled conditions. Guide them through the proper procedure for opening and closing the isolators and ensure they understand the safety precautions associated with the operation.

b. Insulator Inspection: Provide participants with various types of insulators for inspection. Instruct them on how to visually examine the insulators for cracks, chips, or other signs of damage. Encourage participants to document their findings and discuss the implications of damaged insulators.

c. Insulator Cleaning: Demonstrate the proper cleaning procedure for insulators to remove dust, dirt, or pollution deposits. Show participants the appropriate cleaning materials and techniques, such as using a soft brush or non-abrasive cleaners.

Documentation and Analysis: Document the observed results, findings from the hands-on exercises, and any maintenance recommendations related to isolators and insulators. Encourage participants to analyze the data and discuss the importance of regular inspections and maintenance for ensuring the reliability and safety of electrical systems.

Q&A and Discussion: Conclude the lab session with a question-and-answer session and open discussion. Address any queries or concerns raised by the participants and encourage them to share their experiences and insights related to isolators and insulators.

Throughout the lab session, prioritize safety by following appropriate protocols and guidelines for working with electrical systems and equipment. Emphasize the importance of understanding the role and proper maintenance of isolators and insulators in electrical systems to ensure the safety and reliability of the equipment.