Basic electrical engineering transformers notes pdf

Design, develop and test electrical equipment for electrical engineers. They work with electric motors, radar and navigation systems, automotive and aircraft electrical systems, communication systems and equipment for electricity generation. Electrical engineers are licensed by the state. While national licensing requirements may vary, there is a general four-step process to become licensed for electrical engineering in the United States. About Author Karen Schweitzer is a writer and author with 10-plus years of experience. She has written 11 non-fiction books and currently works as a senior editor for Education-Portal.com. In her spare time, she blogs and helps clients with article writing, editing, proofreading and other projects. Without electrical engineers, everything from your home's lighting to smartphone won't work properly. Needless to say, electrical engineers make our world go around, and it's those who spearhead the latest innovations in tech. 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Your first step to becoming an electrical engineer is to learn the basics, and the Ultimate Electrical Engineering Master Class Bundle has all the knowledge needed to do this. You can grab this 5-course bundle on sale for $25, or 97% off. Prices can be changedDon't wait for Black Friday, you can get these top-sellers deep discounts today! Ultimate Electrical Engineering Master Class Bundle – $25See Deal This story, Learn the basics of electrical engineering for only $25 today. originally published in Computerworld. Copyright © 2019 IDG Communications, Inc. Independent, reliable guide to online education for over 22 years! Copyright ©2020 GetEducated.com; Approved Colleges, LLC All Rights Reserved Transformers that increase (step-up) or reduce (step down) electrical voltages are used in many industrial and public service applications. No matter where they are used, it is very important for the installation team to perform a number of different tests before installation. Thorough testing ensures the electrical, thermal and mechanical suitability of the transformer for the serviced system. Most tests energy transformers are defined in national standards established by IEEE, NEMA and ANSI. Each type of transformer and each contractor or utility provider will have the recommended test mode set, but it is important that the installation team carefully performs them to ensure the safe and efficient operation of the system. There are 8 different tests commonly used for power transformers. Most of the testing routine will include most of these tests. The transformer speed test shall be used to ensure that the ratio between the windings of the primary and secondary reels complies with the neat specifications. This test ensures that the transformer will provide the correct step up or step down the voltage. The ratio of speed is calculated by dividing the number of turns in the primary winding by the number of turns in the secondary coil. This calculation determines the expected output of the transformer and gives the appropriate voltage required for the secondary winding. Gradually down the transformer, designed to reduce the voltage, the number of turns in the secondary coil should be smaller than the first, while the step-up transformer, the secondary coil is more turn than the first coil. The ratio is calculated under no-load conditions using a tool called a turn factor tester. Correctly done, the test can identify the performance of the tap changer, abbreviated turns, loose windings, incorrect winding joints and other defects inside the transformers. Simultaneous readings of voltage are performed on low voltage and high voltage winding area after the voltage is applied to a single winding. The ratio is the division between high reading and low reading. If it is a three-phase transformer, each phase shall be examined separately. Known as the Megger test, insulation resistance testing measures the quality of insulation within the transformer. Testing is usually carried out with megohmmeter, a tool similar to several meters, but with much higher power. Some test changes are natural depending on humidity, purity and insulation temperature, but in order to exit, insulation must show greater resistance than specified in international standards for the type of transformer. The insulation resistance test involves measuring the insulation resistance of the device, while the phase and neutral are short-circuited together. In carrying out this test, it is recommended that the tank and the core are always grounded and that each winding is short-circuited at the toss terminals. The resistance between each winding and between all other windings and the ground shall then be measured. The power factor test determines the power loss of the transformer insulation system by measuring the power angle between the ac voltage applied and the resulting current. The power factor is defined as the cosine of the phase angle between the voltage and the current. For perfect insulation, the phase angle is 90 degrees, but in practice the insulation is not ideal. The closer you are to the angle of the phase is up to 90 degrees, the better the insulation. The test shall be carried out with the power factor test set and the joints shall be the same as for the Megger test (insulation resistance test). This test can be repeated during the life of the transformer and checked against the result obtained during manufacture to determine whether the insulation is not functioning properly or decays. Resistance testing shall be carried out for several hours after the transformer has stopped the current when it reaches the same temperature as its surroundings. The purpose of this test is to check for differences in resistance between windings and opening connections. This test ensures that each circuit is properly wired properly and that all joints are tight. Resistance testing shall be carried out using a transformer ohmmeter. The winding resistance shall be calculated by simultaneously measuring the voltage and current – ideally the measured current will be as close as possible to the rated current. By performing this test, you will be able to calculate and compensate for the loss of loads in general. Polarity refers only to the direction of the current flow transformer, and testing is carried out to ensure that all windings are connected equally, not the opposite of one that can cause a short circuit. Polarity is a very important problem when several transformers are parallel or bank connected. Polarity in the transformer shall be classified as additive or subtracted and tested using a voltmeter. If the voltage is applied between the primary bushes and the resulting voltage between the secondary bushes is higher, then this means that the transformer is an additive to polarity. Three-phase transformers shall also be tested for polarity by the same means. This test will determine whether two or more transformers are connected in the correct phase. This test calculates the angular deviations and relative phase sequences of transformers and can be carried out at the same time as the ratio and polarity tests. Primary and secondary winding phase voltages in each transformer can be recorded and comparisons made to obtain a phase relationship between them. The oil that provides the transformer's insulation and cooling properties must be tested before the transformer is started and periodically as part of a regular maintenance schedule. This is usually done with a portable test device which energises the test voltage, which increases the intensity until the oil's point of degradation is detected. Oil sample test can reveal several things about the transformer: Acid numberCompior distributionWeight factorMuture contentInternational tension Oil tests are very useful for determining the state of insulation and oil. Based on these results, a transformer maintenance programme may be established. Although it is the simplest of all tests, visual inspection can detect potential problems that cannot be detected by other, more complex ways Testing. In order to carry out the visual test, a standard procedure should be established identifying the elements and criteria to be examined for judgments which pass/pass the case. They may vary depending on the type of transformer and installation conditions, but most standard visual tests look at the presence of manufacturer's labels, signs of physical damage, weld condition, oil loss or leakage, the integrity of the wiring connections and the condition of the valves and gauges (if any). (e.g. present side by side