شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومـــات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الالكتروني والميكروفيلم

﴿ قـسـم ﴾

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون آية تغيرات

يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %

بعض الوثائق الأصلية تالفة

بالرسالة صفحات

لم ترد بالأصـــل

Tanta University
Faculty of Engineering
Electrical Power & Machines Dep.

Optimal Design of Grounding Systems of Electrical Networks

Thesis Submitted for M. Sc. Degree

By

Eng. Amlak Abaza Kutb El Hariri

B. Sc. In Electrical Engineering Tanta University 1997
Research Assistance in the Electrical Power & Machines Dep.
Faculty of Engineering Tanta University

Thesis Submitted in Partial Fulfillment of the Requirement for the Degree of Master (M. Sc)

Under the Supervision of

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Head of Electrical Power & Machines Dep. Faculty of Engineering Tanta University and Vice Dean for High Graduate and Research

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Lecturer at Electrical Power & Machines Dep. Tanta University

2002

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ABSTRACT

With the growth of number and size of electrical networks, the need for an accurate and more versatile grounding system becomes more important. The importance of the accurate design is coming from both safety and financial considerations.

It is important that the substation ground has an effective grounding resistance, adequate current carrying capacity, and safety future for personnel and equipment.

To design an accurate grounding system, it is essential to evaluate accurately the parameters of grounding system. The parameters of grounding system include modeling of soil resistivity, determining the grounding resistance, calculating the step and touch potentials, and determining the size of grounding electrode.

Different methods with various techniques are presented over many years, to calculate accurately the grounding system parameters. The methods used may be analytical, computer-aided, or graphical method.

This thesis presents a comprehensive literature survey of the methods used to calculate the parameters of grounding system over about 25 years ago. The different methods are introduced exploring different assumptions, approximations, and the applied conditions of each method. Also the advantages and the disadvantages of each method, compared to the other methods, are discussed. Our opinion of each method is remarked.

The measurement of soil resistivity is important in the design of a grounding system. The measurements cannot be used directly in the design.

Modeling of these measurements simplifies the calculation of grounding resistance and potential gradient of a grounding electrode. Moreover modeling of soil resistivity enhance better selection of the suitable grounding electrode.

The grounding resistance of a certain electric system depends on its size and the safety condition required. An accurate formula to calculate the grounding resistance must be used. The accurate estimation of a grounding resistance results in accurate estimation of the values of the potential distribution over earth surface.

The potential gradient control depends on the accurate calculation of values of the tolerable and the actual values of the potentials due to an electrode. The potential gradient of a grounding electrode is a deterministic factor of the safety for personnel and equipments. The actual step and touch potentials of an electrode must be compared with the tolerable values.

At the end of this thesis, guidelines for the grounding system designer are presented. The guidelines help the designer to focus quickly on the most suitable design. The design procedures are presented including the method used to calculate the size of grounding electrode and the maximum grounding current.

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