THREE-DIMENSIONAL MODELLING OF EARTH RESISTIVITY FOR NON-UNIFORM SOIL CONDITIONS

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Degree of Master of Science in Electrical Engineering

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Sri Lanka

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Dissertation submitted in partial fulfillment of the requirements for the

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DECLARATION OF THE CANDIDATE AND SUPERVISOR

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…… ……..…….

Signature of the Supervisor Date:

(Dr. Asanka Rodrigo)

Abstract

The Grounding Resistance and Soil Resistivity plays a major role for the safe operation of electrical power systems, earthing system design, lightning protection systems etc. the corrosion level underground items like piling pipelines also can be evaluated with ground resistivity profiles.

The researches and standards are mostly referring 2-layer soil conditions and horizontal multi layers, still the results are misinterpreted for different possible types of soil layers.

In this research, three-dimensional modelling of earth resistivity layers done using apparent soil resistivity readings and applying the optimization algorithm. A methodology has been proposed to model the actual soil resistivity and layer thickness for a multi-layered soil structure. The apparent earth resistivity measured using Wenner four - point method. The readings further analyzed with MATLAB using genetic algorithm (GA).

The results provided by the GA Constitute the three-dimensional modelling of actual earth resistivity profile for a non-uniform soil. The nobility of the research is to obtain the multi-layer soil characteristics and conclude it to a three-dimensional model through the measurements in soil electric properties in the top surface soil.

Keywords: Soil Resistivity Measurements, Multilayered Soil, Genetic Algorithms (GSs), Optimization.

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List of Abbreviations

Abbreviation	Description
IEEE	Institute of Electrical and Electronics Engineers
BS	British Standards
GA	Genetic Algorithm

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Appendix	Description
Appendix A	Soil test report of 20 MW Wind Power Plant, Kilinochchi
Appendix B	Research Papers