DEVELOPMENT OF 1-D INVERSION ALGORITHM FOR GEOELECTRICAL DATA AND APPLICATION OF GEOELECTRICAL AND GIS FOR GROUNDWATER STUDY IN SINGRAULI COALFIELD REGION, M.P, INDIA

Thesis submitted in partial fulfillment for the

Award of Degree

Doctor of Philosophy

By

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Dedicated
to

My Dear Parents

Satya Narayan and Manju Devi

CERTIFICATE

It is certified that the work contained in the thesis titled **" Development of 1-D inversion algorithm for Geoelectrical data and application of Geoelectrical and GIS for groundwater study in Singrauli coalfield region, M.P, India"** by "Dharmendra Kumar Singh (Roll No. 15151502) has been carried out under my supervision and that this work has not been submitted elsewhere for the award of any degree or diploma.

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DECLARATION BY THE CANDIDATE

I, **Dharmendra Kumar Singh,** certify that the work embodied in this thesis is a bonafide research work carried out by me, under the supervision of **Dr. Nawal Kishore** from **December-2015 to June-2023,** at the Department of Mining Engineering, Indian Institute of Technology (BHU) Varanasi. The matter embodied in this thesis has not been submitted elsewhere for the award of any other degree or diploma. I declare that I have faithfully acknowledged and given credits to the research workers wherever their works have been cited in my work in this thesis. I further declare that I have not will fully copied any other's work, paragraphs, text, data, results, etc., reported in journals, books, magazines, reports, dissertations, theses, etc., or available at websites and have not included them in this thesis and have not cited as my own work.

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LIST OF ABBREVIATIONS/SYMBOLS

GA	Genetic Algorithm
DC	Direct current
VES	Vertical Electrical Sounding
NRSA	National Remote Sensing Agency
LULC	Land use/Land cover
GEC	Groundwater Estimation Committee
NITI	National Institution for Transforming India
BCM	Billion cubic meters
CGWB	Central Ground Water Board
mbgl	meters below ground level
GIS	Geographic information system
NCL	Northern Coalfields Ltd
STPS	Super thermal power plants
CPCB	Central Pollution Control Board
CMPDIL	Central Mine Planning & Design Institute Limited
AVO/AVA	Amplitude Versus Offset/Angle
TDS	Total Dissolved Solids
MCM	million cubic meters
CRD	cumulative rainfall departure
ERT	Electrical Resistivity Tomography

K	Hydraulic conductivity
S	Total longitudinal unit conductance
T	Total transverse unit resistance
GSI	Geological Survey of India
MECL	Mineral Exploration Corporation Limited
EM	Electromagnetic energy
SRTM	Shuttle Radar Topography Mission
DEM	Digital elevation model
SOI	Survey of India
amsl	above Mean Sea Level
SGA	Simple Genetic Algorithm
RRMSE	Relative Root Mean Square Error
GLS	Generalized least squares
SADE	Self-adaptive differential evolution
CRS	Common Reflection Surface
GBM	Ganges-Brahmaputra-Meghna
Wd	Weathered**,**
S.St	Sandstone
λ	Coefficient of anisotropy
BH	Borehole