RESPONSE SURFACE AND NEURO FUZZY METHODOLOGY FOR ROTATING MAGNETIC FIELD AND GMR ARRAY SENSOR FOR CRACK DETECTION IN FERROMAGNETIC PIPE

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Doctor of Philosophy

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SUPERVISOR'S DECLARATION

We hereby declare that we have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Doctor of Philosophy in Electrical Engineering.

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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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LIST OF SYMBOLS

C_i	Centre of the Gaussian Membership Functions
σ_i	Width of the Gaussian Membership Functions
^oC	Degree Celsius
μ	Conducting Material Permeability
$\mathring{A}$	Angstrom
a	Tuning Parameter
B	Vector of Tuning Parameters
I	Current
K	Kelvin
L	Inductance
R	Resistance
V	Voltage
X	Value of Design Variable
x_i	Design Parameter
Y	Vector of Observations
θ	Angle
σ	Conducting Material Conductivity
ω	Angular Frequency
B_θ	Azimuth Magnetic Field
B_r	Radial Magnetic Field

LIST OF ABBREVIATIONS

VT	Visual testing
AE	Acoustic emission
ANFIS	Adaptive neuro-fuzzy inference system
ANN	Artificial neural network
CNC	Computer numerical control
Cr	Cuprum
CTS	Copper tubing size
DAQ	Data acquisition
DC	Direct current
DSECT	Distributed System for Eddy Current Testing
ECT	Eddy current testing
Fe	Ferum
FEM	Finite element model
GMR	giant magneto resistance
MBE	Minimum bias estimator
MFL	Magnetic flux leakage
MRPC	Motorized rotating probe coil
MRPC	Motorized rotating probe coil
MSE	Mean squared error
MT	Magnetic particle testing
NDT	Destructive testing
NDT	Non-destructive testing
PT	Penetrant testing
PVC	Poly vinyl chloride
RPC	Rotating pancake coil
RSM	Response surface methodology
RT	Radiographic testing
RT	Radiographic testing
USB	Universal serial bus
UT	Ultrasonic testing