Declaration

I hereby declare that the work presented in this Thesis titled *Fault diagnosis of a three-phase induction motor using Stockwell transform and machine learning techniques* submitted to the Indian Institute of Technology Jodhpur in partial fulfilment of the requirements for the award of the degree of Doctor of Philosophy, is a bonafide record of the research work carried out under the supervision of *Dr. Abdul Gafoor Shaik*. The contents of this thesis in full or in parts, have not been submitted to, and will not be submitted by me to, any other Institute or University in India or abroad for the award of any degree or diploma.

Megha Singh
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Certificate

This is to certify that the thesis titled *Fault diagnosis of a three-phase induction motor using Stockwell transform and machine learning techniques*, submitted by *Megha Singh (PG201384008)* to the Indian Institute of Technology Jodhpur for the award of the degree of *Doctor of Philosophy*, is a bonafide record of the research work done by her under my supervision. To the best of my knowledge, the contents of this report, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

Dr. Abdul Gafoor Shaik
Ph.D. Thesis Supervisor

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List of Symbols

Symbol	Description
$S(\tau, f)$	Stockwell transform
$S\|(\tau, f)\|$	Magnitude of Stockwell transform matrix
$\angle S(\tau, f)$	Phase angle of Stockwell transform matrix
$W(\tau, d)$	Wavelet transform
$CCF(x, y)$	Pearson correlation coefficient
$Cov(x, y)$	Covariance
f_{bng}	characteristic fault frequency in vibration spectrum
f_{bea}	characteristic fault frequency in current spectrum
BD	Ball diameter
PD	Pitch diameter
FI	Fault Index

List of Abbreviations

Abbreviation	Full form
IM	Induction Motor
$2-D$	2-Dimensional
ST	Stockwell transform
MRA	Multi-resolution Analysis
FFT	Fast Fourier Transform
DFT	Discrete Fourier Transform
WT	Wavelet Transform
CWT	Continuous Wavelet Transform
DWT	Discrete Wavelet Transform
HT	Hilbert- Huang Transform
EMD	Empirical Mode Decomposition
HT	Hilbert Transform
$SWITS$	Stator winding inter-turn shorts
BF	Bearing Fault
BRB	Broken rotor bar
SVM	Support Vector Machine
OAA	One Against All
CCF	Pearson correlation coefficient
PCA	Principal Component Analysis
FDT	Fault Diagnostic Techniques
ANN	Artificial Neural Network
$MCSA$	Motor Current Signature Analysis
OR	Inner-race
EF	Eccentricity