PREFACE

Condition monitoring is an important aspect of an induction motor which is broadly used in industries. Accurate analysis of condition monitoring followed by its mitigation is indispensible. In order to enhance the reliability of the integrated system different time series analysis and time frequency analysis for analyzing the current and voltage signature of the retrieved signal is already reported in literature. However, the limitation of the available techniques has to be introspected in order to make the corrective action in case of any occurrence of failure in any part of the induction motor. In this work the focus is inclined for the protection action for the induction motor by suitable protection algorithm. In this thesis first order thermal model of the induction motor has been considered and the different parameters are optimized by suitable particle swarm optimization algorithm. The optimized parameters have been considered for the design of the thermal relay in order to discriminate different disturbances like mechanical overload and voltage unbalance with consideration of service factor. The cut-off time of the switch is decided by suitable indices after the estimation of the amplitude of the retrieved signal by short-time Fourier transform. The above scheme has been found correct and reliable for the protection objective. Finite element analysis, which is an indicator of discrete difference equation, has been incorporated to analyse 3-D model of induction motor by Ansys software to visualize with more clarity in case of different failures. Experimental prototype has been performed in electrical machine lab, both in healthy as well as faulty condition of induction motor. The associated total harmonic distortion of the current signal has been analysed by fast Fourier transform both for healthy and faulty situation. In context of the above fact the inter-turn fault is analysed with evaluation of total harmonic distortion with different case studies being considered. Further, the healthy and faulty condition has been classified by suitable

pattern classification scheme, such as artificial neural network and support vector machine. The classification accuracy of SVM is found better than that of ANN.

The reliability which is an important aspect of induction motor has been analysed with evaluation of different indices like: MTBF and failure rate for risk, safety, adequacy and dependability enhancement of IM. Further, it is suggested to augment the reliability indices by different equipments associated to improve the same. Finally, roadmap of the research is clearly reflected with comprehensive analysis of all the chapters being concatenated. Thus, this thesis work would be definitely helpful for the future researchers working in the similar areas with a clear reflected guidance.