Acknowledgments

First of all, my deepest gratitude to the Almighty for his providence and blessings.

It is my proud privilege to express my sincere gratitude to my supervisor Dr. Rajesh N. Patel (Professor and Head, Mechanical Engg. Dept., Institute of Technology, Nirma University) for his invaluable guidance, kind cooperation, constant encouragement and moral support throughout the research work.

I would also like to thank members of my research progress committee, Prof. Vikas J. Lakhera (Professor, Mechanical Engg. Dept., Institute of Technology, Nirma University) and Prof. N. M. Bhatt (Director, Gandhinagar Institute of Technology, Ahmedabad) for their valuable suggestions and insightful comments given during my all progress seminars. I also extend my special thanks to Prof. Vikas J. Lakhera who is my colleague also for all the necessary help, constant encouragement and moral support throughout the research work.

I am very much thankful to Dr. K Kotecha (Ex-Director, Institute of technology, Nirma University) who always encouraged and motivated me for doing quality research. I am grateful to the Management of Nirma University for giving permission to pursue Ph.D. and for provision of infrastructural facility. I am also thankful to Dr. A.S. Patel (Dy. Registrar, Nirma University) Ms. Prashya and Mr. Sachin Kikani from Ph.D. section for their help whenever required.

I recognize that this research would not have been possible without the financial support from Gujarat Council on Science and Technology (GUJCOST), Gandhinagar, India (Project No: GUJCOST/MRP/201574/10-11/3718). I gratefully acknowledge GUJCOST for their financial support to undertake this study.

My special thanks to my colleague Dr. A. M. Lakdawala (Associate Professor, Mechanical Engg. Dept., Institute of Technology, Nirma University) for the technical discussions on number of occasions throughout my research work. I am also thankful to Prof. V. M. Bhojawala (Assistant Professor, Mechanical Engg. Dept., Institute of Technology, Nirma University) Dr. J. G. Jamnani (Ex-Professor, Electrical Engg. Dept., Institute of Technology, Nirma
University), Prof. Amit Patel (Assistant Professor, Electrical Engg. Dept., Institute of Technology, Nirma University) and Prof. Vimal R. Patel (Assistant Professor, Automobile Engg. Dept., L. D. College of Engineering) for their help during the research work.

I am also thankful to our lab assistants Mr. A. G. Patel, Mr. D. M. Rathod; our workshop staff Mr. I. R. Patel, Mr. D. V. Nayak, Mr J. D. Rawal, Mr. Ramjibhai Patel and our peon Shri Surendrbhai for helping me as and when required during the research work.

I am also thankful to my M. Tech and B. Tech. students Karan, Abhishek, Nimit, Maulik, Ankur, Kiran, Nihar and Tejas for their help during my research work.

I express my heartfelt gratitude to my parents for their constant support and encouragement. Finally indebted to my wife Neha, my daughter Riya and son Aditya, who have taken pains along with me and without which this work would not have seen the light of success.

At last, I extend my sincere thanks to all those who helped me directly or indirectly in the research work.

Date: 19/10/2015

Sanjay V. Jain