ACKNOWLEDGMENT

The work presented in this thesis would not have been possible without my close association with many people. I take this opportunity to extend my sincere gratitude and appreciation to all those who made this Ph.D. thesis possible.

First and foremost, I would like to extend my sincere gratitude to my research guide Dr.Piyush P Gohil for introducing me to this exciting field of science and for his dedicated help, advice, inspiration, encouragement, and continuous support, throughout my Ph.D. His enthusiasm, integral view on research and his mission for providing high-quality work, has made a deep impression on me. During our course of interaction during the last 4 years, I have learned extensively from him, including how to raise new possibilities, how to regard an old question from a new perspective, how to approach a problem by systematic thinking, data-driven decision making and exploiting serendipity. Every time, I meet him, I can feel "the fire in the belly" which he always talks about. I owe him lots of gratitude for having me shown this way of research. I am really glad to be associated with a person like Dr. Piyush P Gohil.

My special words of thanks should also go to my Head, Mechanical Engineering Department, Prof (Dr.) Dharmendra S Sharma for his continuous support, guidance, cooperation, encouragement, and for facilitating all the requirements, going out of his way. He has taught me another aspect of life, that, "goodness can never be defied and good human beings can never be denied" and has always kept me going ahead.

I am also very thankful to Prof.(Dr.) Arun Pratap, Dean, Faculty of Technology and Engineering for his constant guidance, cooperation, motivation, and support. I owe a lot of gratitude to him and I feel privileged to be associated with a person like him during my career.

My heartfelt thanks to Head, Mechanical Engineering, CSPIT-CHARUSAT, and other faculty members Dr.Kundan Patel and Dr. Sagar Choksi for their valuable help and support. They always helped me out when I got any difficulties or queries regarding experiments. My special thanks for always standing by my side and sharing a great relationship as compassionate friends. I will always cherish the warmth shown by them.

I express my heartfelt gratitude to Mr. Ravi Gokani, Lecturer in Mechanical Engineering at Government Engineering College, Jamnagar for being with me, and for his scientific inputs, personal help and friendly nature has always made me feel at ease during my course of Ph.D.

My special regards to all my teachers of course work subjects (which are mandatory for Ph.D. scholars to qualify and to earn credits), because of their teaching and imparting knowledge on different research subjects has made it possible for me to see this day. Because of their kindness I feel, was able to reach a stage where I could write this thesis.

I gratefully acknowledge **Research and Consultancy Cell of the Maharaja Sayajirao University of Baroda**, for providing me financial support (vide letter no. RCC /Dir /2017/335/29 dated 10-02-2017) to carry out my research in the Department of Mechanical Engineering, Faculty of Technology and Engineering in this University

As always it is impossible to mention everybody who had an impact on this work however there are those whose spiritual support is even more important. I feel a deep sense of gratitude for my grandparents, mother, and father, who formed part of my vision and taught me good things that matter in life. Their infallible love and support have always been my strength. Their patience and sacrifice will remain my inspiration throughout my life. I am also very much grateful to all my family members for their constant inspiration and encouragement.

My heartfelt regard goes to my father in law and mother in law for their love and affection, inspiration and continuous support, led me to this stage

I owe my deepest gratitude towards my better half for her eternal support and understanding of my goals and aspirations. Her infallible love and support have always been my strength. Her patience and sacrifice will remain my inspiration throughout my life. It gives me immense pleasure to declare my gratitude to my beloved wife **Pallavi** on my part in these few words. I am thankful for my dear sons **Jay and Jeet** for giving me happiness, motivation, and support during my studies who were always ready to give their timely help whenever I required. Without their help, I would not have been able to complete much of

what I have done and become who I am.

A special mention of thanks to my all students for their constant support and cooperation during my research. Their timely help and dedication shall always be remembered.

Finally, I am thankful to the library staff and administrative staff of this University for their cooperation and support during my Ph.D. work.

Parmar Vijaykumar Mohanlal (FOTE/901 Dt.07/05/2016)