

ACKNOWLEDGEMENTS

First of all, I am always indebted to Almighty to bestow me with good health, courage, inspiration and opportunity.

Next, I express my profound gratitude to my guide Dr. Rajesh C. Shah, Associate Professor, Department of Applied Mathematics, The Maharaja Sayajirao University of Baroda. It is because of his generous counselling, criticism and helpful suggestions; I have completed this herculean task. He gives great impetus to my research career. He always encouraged me to pursue my research and motivated me by reminding that I have strong research aptitude. Initially, whenever I started to read new research articles, he showed me how to read it. Despite, heavy work load of teaching, departmental administrative work and family responsibilities; he always managed time to check my work thoroughly and provided me crucial directions. Without his continual inspiration and support, it would not have been possible to complete this study so effectively. Even, I have survived through a very turbulent time of my life because of his guidance and motivation. So, he is not only my research guide but my true mentor. I pay my obeisance to him.

I am thankful to late Prof. D. C. Vakaskar, former Head, Department of Applied Mathematics, The Maharaja Sayajirao University of Baroda for giving me valuable suggestions and allowing me to register for Ph. D. I am also thankful to Dr. B. M. Shah, Head, Department of Applied mathematics for his encouragement and fruitful suggestions during my presentations in the department which has definitely improved the quality of my thesis.

I am extremely thankful to the Dean, Faculty of Technology & Engineering, The Maharaja Sayajirao University of Baroda, and Principal, Polytechnic, The Maharaja Sayajirao

University of Baroda, for providing research facilities and support during the pursuit of the present work.

Words are inadequate to express my deep gratitude to my research monitoring committee members Prof. P. S. Kantawala, Dr. T. P. Shah and Prof. R. C. Tandel, Head, Department of Applied Chemistry for their constant helps, encouragement and patent advice throughout my Ph. D. study. I am also grateful to Dr. S.B. Rao, Dr. P. K. Pandit, Dr. B. S. Ratanpal, Dr. Jaita Sharma, Dr. Nimisha Pathak for their valuable comments during my presentations in the department.

I am extremely thankful to teaching assistants of Department of Applied Mathematics which includes Mr. Anil Chavda, Mr. Shardav Bhatt, Mr. Amar Mangrola, Mr. Yash Sule and Ms. Divya Rathod for their constant support during my research work. I extend my gratitude to the office staff Ms. Madhuri Wardy, Mrs. Pooja More, Ms. Sapna Chavhan for their cooperation and support during my presentations and in the laboratory at any time during my study.

I would like to take the opportunity to extend my sincere thanks to my fellow research scholars Dr. Dilip Patel, Dr. Ramesh Kataria, Dr. Darshana Patel and Dr. Nayan Patel for their fruitful academic discussions.

Last but not the least, I would like to express my sincere thanks to all my colleagues at Polytechnic, The Maharaja Sayajirao University of Baroda which includes Mr. V.A. Bhatt, Mr. Dhruvit Trivedi, Mrs. Bhavika Panchal, Mrs. Rakhi Moghe, Mrs. Janki Dave, Mrs. Neha Trivedi and Ms. Tiji Varghese for their cooperation and support.

February, 2021

Rajiv Shah
(M.Sc., M.Phil.)