

Acknowledgements

On the blissful and ecstatic movement of humbly submitting this dissertation, I first of all conscientiously thank, with utmost reverence, the almighty God who blessed me- who enabled me to channelize my energy into this work- and whose affectionate touch was with me to triumph all the obstacles. In my academic journey, many people have helped me to conduct and complete this research work. Here, I will try to remember some of them who have contributed towards making this journey a successful one, directly or indirectly.

I would take this opportunity to thank my Thesis Supervisor, **Dr. Atul Kumar**, for introducing me to the area of quantum entanglement and information processing. As a guide, he has been a great support throughout my research work. I will always value the constructive discussions we had related to my research problem. In spite of his academic and administrative responsibilities, he was always available for discussion- be it academic or personal. He has been extremely patient, sincere and attentive towards my holistic development as a Ph.D. student. On the personal note, he is a wonderful person to interact with who always encourages his students to become an independent researcher and thinker.

It gives me immense pleasure to express my heartfelt gratitude to **Dr. Satyabrata Adhikari** for providing his knowledgeable guidance and generous support during the start of my academic career.

I wish to thank all my Doctoral Committee members, **Dr. Ambesh Dixit, Dr. Ashutosh Kumar Alok and Dr. Mahesh Kumar**, for their inputs and constructive suggestions during the comprehensive examination and State-of-the-Art seminar- their critical comments and questions always encouraged me to read more and more about different aspects of quantum information and computation.

I also thank **IIT Jodhpur** for providing the required infrastructure and research facility to carry out the research. I further wish to thank **Technical Education Department of Rajasthan** for granting me permission and facilities to continue my research as a Ph.D. student of IIT Jodhpur. I would also like to thank all the **staff members** in the Focus Group of System science, Department of Computer Science and Engineering, and Department of Chemistry in IIT Jodhpur for extending their helping hand whenever and wherever required. Their always ready to help attitude allowed me to approach them with an open mind for any sort of official help.

I would like to express my thanks to my fellow Ph.D. students **Hargeet Kaur, Jyoti Faujdar** and **Anoopa Joshi** for their support and affection, and for maintaining a healthy and enthusiastic research environment in the laboratory.

I now wish to thank my friend and well wisher who will always hold a very special part in my life. I would like to thank **Gurveer Singh** for his brotherly love and positive attitude which has always encouraged me to do well in life.

I strongly believe that nothing can be achieved without parents blessings. This is probably the right moment to thank my father **Sardar Baldev Singh** and my beloved mother **Sardarni Jasvinder Kaur** and in-laws **Sardar Gurdeep Singh** and **Sardarni Jasveer Kaur**, for their constant love, sacrifice, patience and moral support.

I feel extraordinary fortunate to have moral support and help especially in writing aspect

from my dear wife **Paramjeet Kaur** in particular while completing the thesis work. It is my proud privilege to give my gratitude to my loving sisters **Mrs. Ramandeep Kaur, Mrs. Rajpal Kaur Mrs. Sukhjeet Kaur** and **Mrs. Dr. Mandeep Kaur**, my respected Jiju **Mr. Gurdeep Singh, Mr. Haramritpal Singh, Mr. Ranveer Singh** and **Dr. Mandeep Singh** for their moral support. I wish to make special mention of my loving son **Samarjeet Singh** whose smile is my life.

Parvinder Singh