Acknowledgment

I owe the intellectual freedom to my supervisor Dr. Subhashish Banerjee, necessary to explore such different subjects as quantum information, graph theory, and matrix analysis. It is not an easy task to supervise a student with a critical tendency to do only what he has in mind! It is a pleasure to acknowledge helpful discussions with him, which significantly contributed to the development of my scientific writing skill as well as my understanding of quantum information. Moreover his exceptionally hard working nature is an inspiration for my research carrier in future.

This thesis would be substantially different without the treatment of Dr. Bibhas Adhikari, with whom I had useful interactions at Indian Institute of Technology (IIT) Jodhpur and IIT Kharagpur. I would like to warmly thank this wise person for a number of fruitful discussions. Several times he hosted me to discuss my work at the Department of Mathematics, and Centre for Theoretical Studies of IIT Kharagpur.

I am also thankful to Dr. R. Srikanth of Poornaprajna Institute of Scientific Research, Bangalore, with whom I discussed a number of topics in quantum entanglement. Also, I am thankful to Prof. Guruprasad Kar of Indian Statistical Institute Calcutta for discussions in quantum information theory.

I have enjoyed the company of many people who provided me academic and material support during my PhD. My undergraduate friend Kaushik Biswas brought a meaningful change in my unemployed life by informing me the project vacancy at IIT Jodhpur. My first hostel accommodation at IIT Jodhpur was arranged by Supratim. I used to share the hostel room of Sibendu Samanta, a PhD student of IIT Kharagpur, during my every visit at Kharagpur. I used to take frequent help in computer programming from Amrik Singh and Supratim. Discussions with Javid Ahamad Naikoo helped me to develop my understanding in quantum mechanics. I used to have a regular discussion on complex networks with Ranveer Singh and Rohan Sharma. In addition, I gained a lot of social experiences at IIT Jodhpur during my PhD life.

Last, but not least, I wish to acknowledge the sources of financial supports during my PhD. Initially, I started working as a staff of the project "Graph Theoretical aspects in Quantum Information Processing" (Grant no: 25(0210)/13/EMR-II) funded by Council of Scientific and Industrial Research (CSIR), New Delhi. Finally, with the help of my Graduate Aptitude Test in Engineering (GATE - 2013) score, I was registered as a regular PhD student of IIT Jodhpur supported by the institute fellowship.

The encouragement and sacrifice of my mother during my doctoral research work is gratefully acknowledged. The time and effort spent on research at IIT Jodhpur must certainly have been reflected in neglecting her. Thanks for her forbearance.

Supriyo Dutta.