Some Results On Multidimensional Shift Spaces

A Thesis submitted by **Dileep Kumar**

in partial fulfillment of the requirements for the award of the degree of **Doctor of Philosophy**



Indian Institute of Technology Jodhpur Department of Mathematics March 2020

Declaration

I hereby declare that the work presented in this thesis titled "Some Results On Multidimensional Shift Spaces", submitted to Indian Institute of Technology Jodhpur in partial fulfilment of the requirements for the award of the degree of Doctor of Philosophy is a bonafide record of the research work carried out under the supervision of Dr. Puneet Sharma. The contents of this thesis in full or in parts, have not been submitted to, and will not be submitted by me to any other Institute or University in India or abroad for the award of any degree or diploma.

Dileep Kumar PG201383502

Certificate

This is to certify that the thesis titled "Some Results On Multidimensional Shift Spaces", submitted by Dileep Kumar (PG201383502) to Indian Institute of Technology Jodhpur for the award of the degree of Doctor of Philosophy is a bonafide record of the research work done by him under my supervision. To the best of my knowledge, the contents of this report, in full or in parts have not been submitted to any other Institute or University for the award of any degree or diploma.

Paneet Sharma Ph.D. Thesis Supervisor

Acknowledgments

The research work carried in this thesis is done under the guidance of Dr. Puneet Sharma. I am very grateful to my supervisor for his expert supervision and research insight. His never ending patience and constant guidance throughout my Ph.D. journey helped me in completion of this work. I thank him for unflinching encouragement and unconditional support throughout this work. I am grateful to him for his inspiration, constant support, and never ending patience. It was his valuable suggestions, understanding, enthusiasm and vivid discussions that helped me to complete my doctoral work.

I am thankful to IIT Jodhpur for providing me with the necessary facilities which helped me in accomplishing my research work. I would like to thank my doctoral research committee members Dr. Gaurav Bhatnagar, Dr. Ashutosh Kumar Alok and Dr. Anand Krishnan Plappally for their fruitful suggestions. I also thank the Ministry of Human Resource Development (MHRD) for providing financial support during my PhD, which helped in the completion of my doctoral work.

I would like to thank my family for their love, support and sacrifices. I am forever indebted to my parents Mr. Jageshvar Prasad and Mrs. Rajendra Devi and my uncle Mr. Jagdish Prasad for their constant encouragement and support. I am also grateful to my beloved siblings Mr. Vikram, Chandra Prakash, Pooja and Uma for their love, affection and good wishes. I am most grateful to my elder brother Mr. Vikram for giving me mental strength and encouraging me to complete this work. I would like to thank all my friends whose constant encouragement and support made this possible. I would particularly like to thank Dr. Manish Raghav, Rohit Kumar, Prashant Kumar, Kumar Rahul and Abhinav for all their help, support, tons of great food, endless cups of tea, coffee and great company during my stay at the institute. It was wonderful and memorable time that I spent with you guys. Finally, I thank almighty God for great health and giving me the strength to accomplish my research work.