ACKNOWLEDGEMENT

This thesis, the conclusion of several years' work, is a result that I could not have achieved without the support of many people to whom I would like to express my gratitude.

Foremost I would like to express my gratitude towards my supervisors Prof. P. K. S. Dikshit and Prof. S. B. Dwivedi, Department of Civil Engineering, Indian Institute of Technology, Banaras Hindu University, Varanasi, for their constant guidance, valuable suggestions, and kind encouragement during my association with their research group.

I willfully thanks to Dr. Medha Jha, Department of Civil Engineering, Indian Institute of Technology, Banaras Hindu University, Varanasi for being my internal expert of the subject of the thesis. She assisted me in all area of the thesis and clarified technical doubt, and encouraged me by means of support, advice, and inspiration.

I thank Prof. Prabhakar Singh, Department of Physics, Indian Institute of Technology,

Banaras Hindu University, Varanasi for being my external expert and for his constant

guidance, valuable suggestions, and kind encouragement during my research work.

I am thankful to Prof. P. K. Singh, Head, Department of Civil Engineering, Indian Institute of Technology, Banaras Hindu University, Varanasi, for providing necessary facilities during my research work and for providing a pleasant working atmosphere in the Department.

I have a deep sense of gratitude for all Teachers of the Department of Civil Engineering, Indian Institute of Technology, Banaras Hindu University, Varanasi for their cooperation and inspiration. I am thankful to the non-teaching staff of the Department of Civil Engineering, Indian Institute of Technology, Banaras Hindu University, Varanasi.

I would also like to thank my seniors, Dr. K. Narayan, Mr. S. Srivastav, and Dr. Manvendra Singh Chauhan; colleague, Mr. A. K. Rahul, Mr. Nikhlesh Singh, Mr. Satyajit Mandal, and Mr. P. J. Omar for their helpful and needy suggestions for the better quality of work.

I would like to acknowledge my indebtedness to my parents Mr. Prabhat Shivhare, and Mrs. Anuradha Shivhare, my sister Miss. Aishwarya Shivhare and brother Mr. Prashant Shivhare, for their love, affection, prayer, and support.

In particular, I would like to thank Mr. Akash Mitra, my husband, for his patience, attention, understanding, and support during the development of this study. Additional gratitude is extended to my in-laws: Mr. Ashok Mitra and Mrs. Shikha Mitra for their blessings, love, and affection.

I am also thankful to MHRD for providing financial assistance during my research work.

Lastly and above all, deeply grateful to the invisible yet present helping hands of Lord Shiva, with which he has made my life complete and full of meaning.

Nikita Shivhare