

Acknowledgements

First and foremost, I would like to express my deep and sincere gratitude to my supervisor and advisor **Prof. Shamsheer Bahadur Singh** for his support and encouragement from the beginning of my research work. Without his encouragement, expertise, and decision-making skill it would have not been possible to complete my research. I have learned so many things from him and it's my greatest privilege to work under his guidance. During my tenure, he contributed to a rewarding doctorate experience by giving me intellectual freedom in my work, supporting my attendance at various conferences, engaging me in new ideas, and demanding a high quality of work in all my endeavors.

I am grateful to CSIR and BITS Pilani for providing financial support for this project. They provided all the necessary facilities required for my research work. My special thanks to Prof. Souvik Bhattacharyya, Vice Chancellor BITS Pilani for giving me an opportunity to work in the institute. I express my sincere thanks to Prof. Ashok Kumar Sarkar (former director) of BITS Pilani and Prof. Sudhirkumar Barai, Director of BITS Pilani for their motivational support. I also show my gratitude to Dr. NVM Rao, Chief of central purchasing unit, BITS Pilani for providing me all the material required for my research work. I also take opportunity to thank Prof. J. P. Misra, Unit chief, IPC, BITS Pilani for providing me the software required for my research work. I also show huge respect to my Doctoral Advisory Committee Members Dr. Dipendu Bhunia and Dr. S. N. Patel for their suggestions and constructive comments and for taking out time from their busy schedule and giving valuable comments and feedback on the thesis work that helped me to improve it.

This thesis is the outcome of a long rigorous journey in which I have been encouraged and supported by many people. It is indeed a pleasant moment to express my gratitude for them. I would like to express my gratitude to Prof. S. K. Verma (Dean, Academic Research Division). I would like to thank Dr. Anshuman (former HOD) and Dr. Anupam Singhal (HOD, Civil Engineering Department, BITS-Pilani, Pilani Campus) for their kind moral support and assistance. I am also thankful to all eminent faculty members Prof. Rajiv Gupta, Prof. A. P. Singh, Dr. K. Kumar, Dr. Anshuman, Dr. G. Muthukumar, and Dr. Shibani Jha for their support, insightful comments and suggestions during Ph.D end semester seminars, which helped me to widen my

research from various perspectives. I am also thankful to all non-teaching staffs such as Mr. Suresh Saini, Mr. Kamal, Mr. Shiv Ratan Sharma, Mr. R. D. Soni, Mr. Om Prakash, and Mr. Bhim Singh for their timely support.

The greatest gift of life is friendship and received it in the form of Mr. Abhishek, Ms. Deepthi Reddy, Dr. Harish Puppala, Dr. Himanshu Chawla, Dr. Pankaj Munjal, Dr. Shaik Hussain, Dr. Manpreet Singh, Dr. Pritam Satya, Dr. Rahul Dandautiya, Mr. Raghavendra Kumar, Mr. Ramakrishna, Mr. Rishab Bajpai, Mr. Vishal Singh, Ms. Soumya Kar, Mrs. Somya Agarwal, Ms. Vidhi Vyas, Mr. Siva Pulleti, Mr. Bhaskar, Mr. K. Srinivas and Mr. Rajesh. Thank you all for making a wonderful and enjoyable life at BITS Pilani campus.

Last but not the least; I am thankful to my entire family. My father Mr. Vummadisetti Sesaiah, who has been my strength and support throughout my life and my mother Mrs. Sumathi for her unconditional love. I am lucky and blessed to have sister Mrs. Nagalakshmi. I thank my wife Mrs. Kranthi Vijaya for her care, affection shown, and sacrifices made throughout my Ph.D. Also, I would like to mention my daughter Gaanavi Praanya for being a bliss and lucky charm in my life.

VUMMADISETTI SUDHIR