Preface

This thesis include the characterization of neutron stars using archival data of neutron star high-mass X-ray binaries (HMXBs) observed by *Suzaku*. It is for the first time till date that such comprehensive study has been carried out for a large number of sources and over a broadband energy range from 0.8-70.0 keV. Simultaneous timing and spectral study of some individual X-ray binaries like SW J2000.6+3210, OAO 1657-415, 4U 0114+65 have also been thoroughly studied using *Suzaku* and *Swift*-XRT data. Detailed timing studies on individual pulsars has also been carried out using *Suzaku*. Using corrections for Doppler shifts, methods of accurately determining the mid-eclipse times of eclipsing, low eccentricity neutron star binary systems have been establised. In timing analysis, study of long-term pulse profile stability of a short isolated pulsar PSR B1509-58 using all archived *RXTE*-PCA data following Fourier decomposition technique have been carried out.

This thesis is the outcome of my research work carried out at the Department of Physics, University of North Bengal, West Bengal, India and Raman Research Institute, Sadashivnagar, Bengaluru, India.

Working on this thesis has been a very memorable journey for me. It has enriched me with a collosal of knowledge and has inculcated in me a curiosity to know more. On a personal front, it has taught me patience and discipline.