Abstract of the Thesis

The thesis titled "Ultraviolet Spectroscopic Studies of Seyfert 1 galaxies and quasars" is the result of my research work carried out using the UV spectroscopic data obtained by the International Ultraviolet Explorer (IUE) satellite between May 1978 to October 1991. IUE has obtained the low resolution (≈ 6Å) spectra of Seyfert 1 galaxies and quasars in the 1100 – 3200 Å wavelength region. In thesis, I have undertaken the study of luminosity correlations of strong UV lines such as Lyα, CIV, NV, SiIV, CIII] and MgII with the underlying continuum of 96 active galaxies comprising Seyfert 1 galaxies and quasars. The important objectives were to measure the line and continuum fluxes, equivalent widths these strong lines, line and continuum luminosities, UV spectral indices and the line flux ratios. This thesis basically addresses the issue of line and continuum correlations existing in the Seyfert 1 galaxies and quasars.

The study of the shape of UV continuum dependence on redshift, variability characteristics, the multifrequency spectral energy distributions and the luminosity – luminosity correlations were the important objectives of the thesis. Chapter-1 provides the introduction and review of the present status of our understanding of the Seyfert 1 galaxies and the quasars, which are the two important classes of active galaxies. Chapter-2 describes the IUE satellite, its design and instrumentation, UV detectors, observational techniques, data acquisition and reductions applied to the data using IRAF software. In chapter-3, I have presented the line and continuum flux measurements, spectral index calculations, luminosity distance calculations and the line and continuum luminosity calculations. The UV line and continuum variability studies are also provided in this thesis.
Chapter-4 deals with the most important line and continuum luminosity correlation studies. The EW correlations with redshift and continuum luminosity are also presented in this chapter. Chapter-5 deals with the construction of the multifrequency spectral energy distributions by incorporating the UV fluxes and the luminosity-continuum luminosity correlations. In chapter 6 a summary of all the results and the final conclusions are presented. A note on the further study of these objects using new spectroscopic data possibly making contemporaneous observations across all the wavelength regions is presented in the last section.

It is found that the UV spectral indices become flatter in higher luminosity AGNs and are observed to be uncorrelated with the redshift. From the variability studies I find that the time delays are less than a day. Two categories of change in the UV line fluxes are identified. The high ionizations lines and low ionization lines exhibit line and continuum flux variability with time delay of few days. All the broad lines show a strong linear dependence at all the selected UV continuum wavelengths. The line luminosities are uncorrelated with the redshift. The equivalent widths of the lines show a week direct anticorrelation with the UV luminosities. The observed direct dependence of the line luminosities of the strong UV lines with the underlying continuum is the most important result. This result indicates that the lines are basically emitted by the photoionisation of the primary continuum radiation of the central engine by the BLR gas. The values of the slopes obtained are less than which implies that the near dependence of line-continuum luminosity is less perfect compared to the line-continuum correlations.

In the study of multifrequency spectral energy distributions, the excess UV bump along with IR and soft x-ray excess are observed as the dominant spectral features. The IR through x-ray flux distribution is approximately constant. It is also found that a week direct correlation exists among UV luminosity and luminosities at x-ray, optical, NIR, FIR, and radio waves. The most significant aspect of the results
obtained in this thesis is that the Seyfert 1 galaxies (Sy 1) and quasars show similar spectral properties and correlations. In none of the correlations I find a discontinuity or change in the correlations between Sy 1 galaxies and quasars. The earlier studies of Sy galaxies and quasars at x-rays, optical, IR and radio wavelength regions have treated these as two phenomenologically different objects. But the similarity of the results for both Seyfert 1 galaxies and quasars obtained in this thesis indicate that these two classes of objects are intrinsically the same with probably similar physical processes undergoing in the nuclear engine.