ABSTRACT

The Laplace transform method in combination with the Wiener-Hopf technique for the exact solution of the Radiative Transfer problem has received much less attention in the history of the transport theory. But the method is undoubtedly an interesting alternative to the other existing method for exact solution of the Radiative Transfer problems. Section 2.2, 2.3 and 2.5 of Chapter 2 is devoted to study scattering problems in an atmosphere scattering anisotropically by the method of Laplace transform in combination with the Wiener-Hopf technique. The work in section 2.2 has been published in Earth, Moon and Planet Vol. 59, pp. 1-10, 1992. The work in section 2.3 has been published in Astrophys. Space Sci. Vol. 179, pp.89-96, 1991. The work in section 2.5 has been published in Lecture Notes in Mathematical Sciences , " Proceedings of the National Seminar on Mathematical Modeling " Vol. 2, pp.70-78, 1994.

One of the most important achievement in the field of stationary transport theory is the introduction of H-,X- and Y- functions for problems of semi-infinite and finite media. Time - Dependent X- and Y- functions are discussed in section 2.6. In section 2.4 and 2.6 of Chapter 2 exact solutions has been obtained by the method of Principle of Invariance. The work in section 2.6 has been published in Astrophys. Space Sci. Vol. 189, pp. 95-117, 1992.

In Chapter 3 , the equation of transfer has been solved exactly using "Laplace transform and Wiener-Hopf technique" (sec-3.3) and modified Principle of Invariance (sec-3.4) and approximately by the method of Discrete Ordinates (sec-3.5) and Eddington's approximations (sec-3.2) in an isotropic coherently scattering atmosphere with an

exponential form of Planckian source function. The work in sec-3.2 , sec-3.3, sec-3.4 and sec-3.5 has been published in Astrophys. Space Sci. Vol 178, pp. 299-302, 1991., Vol. 189, pp. 119-122, 1992., Vol. 192, pp. 127-132, 1992 and Vol.192, pp. 209-217, 1992 respectively.

In Chapter 4 , in section 4.2 and 4.3 the equation of transfer for interlocked multiplets which is a noncoherent scattering has been solved approximately by the method of Discrete Ordinates and exactly by the method of modified Principle of Invariance using Planckian source function as an exponential function of optical depth. In the subsequent sections in this chapter the residual intensities for doublets and triplets has been calculated using some approximate forms of H-function and the results are shown in both tables and figures. The work in sec-4.2 and sec-4.3 has been published in Astrophys. Space Sci. Vol. 178, pp. 107-117, 1991 and Vol 184, pp. 57-63, 1991 respectfully.

In section 5.2 of Chapter 5 the one sided Laplace transform together the theory of Linear singular operators has been applied to solve the transport equation which arises in the problem of a finite atmosphere with the Planck's function as an exponential function of optical depth. In section 5.3 of the same chapter , Laplace transform technique is applied to Time-Dependent X- and Y- functions which play a central role in Radiative Transfer problems, to obtain Fredholm equation. An exact linearized and decoupled integral equation satisfied by Time-Dependent X- and Y- functions has been obtained in section 5.4. The work in sec-5.2 , sec-5.3 and sec-5.4 has been published in Astrophys. Space Sci. Vol. 181, pp. 267-275, 1991., Vol. 196, pp. 223-339,1992 and Vol.203, pp. 135-138, 1993 respectively.

A few relations assumed during the solutions have been obtained and discussed in Appendix I, II and III.