SYNOPSIS OF CHAPTERS.

In the following, we briefly summarise the contents of Chapter I and Chapter II.

Chapter I is divided into seven subchapters.

Subchapter IA : In this subchapter we have derived time-dependent X' and Y' functions for homogeneous, plane-parallel non-emitting and isotropically scattering atmosphere of finite thickness using integral equation approach. The approach was initially proposed by Rybicki (1971) for treating search light problems in multidimension geometry using Fourier-Transform. Here we introduced Laplace transform in time-domain. The resulting integral equation is solved with the help of Sobolev's (1963) resolvent technique which leads to the solution of some non-linear integral equations involving certain X' and Y', functions. It is found that if the Laplace transform parameter is put equal to zero, these functions atonce reduces to the stationary X' and Y' function which was studied by Chandra-Shekhar (1960) and Busbridge (1960).

Sub-chapter IB : We have again considered an isotropically scattering homogeneous and finite mediums with certain incident radiation on the upper surface. We have now treated the problem with the help of principle of invariance of Chandrashekhar (1960). The solution of diffuse radiation and transmission problem for the case when t_1 - i.e. time-spent in absorption scattering is much less that t_2 - i.e. time spent in successive scatterings, has come out in the form of certain X' and Y' functions which have the same form as

deduced in IA.

Sub-chapter IC : Nonlinear integral equations for X'- and Y'-functions are derived by using principle of invariance for an anisotropically scattering and inhomogeneous atmosphere. Two cases of primary interest are studied. The first one involves the incidence of collimated light of net flux 4 from certain direction on the upper surface with no incident radiation on the lower surface. The second case is just the reverse one.

Sub-chapter ID : In this sub-chapter we have considered one-speed one-dimensional equation of transfer for neutrons in a finite slab with isotropic scattering. By introducing certain exponentially decreasing and increasing infinite medium eigenfunctions (Case, 1960) and using the arguments employed in principle of invariance, we have deduced the time-dependent X' and Y', functions which obeys usual nonlinear integral equations, with some constraints equations.

Sub-chapter IE : This sub-chapter is devoted to study the diffuse reflection and transmission of radiation by a finite atmosphere bounded by reflecting surface. This type of atmosphere are considered in planetary atmospheric studies. Various studies are made on particularly two types of reflective surfaces, viz., Lambert's law reflector and specular reflector for different types of planetary atmosphere. But almost all of them are confined to stationary transport equation. We have considered nonstationary transport equation with anisotropic scattering. One of the boundary surface (bottom) is a reflecting surface and no radiation can escape from

this surface. A time-dependent probability function, which estimates the measure of the probability that a photon in some direction and time will reappear after reflection in some other direction and time from the bottom surface, is introduced. We have derived functional relations involving scattering and transmission function using principle of invariance.

Sub-chapter IF : The F_n(Facile) method has been found to be extremely usefull in various transport calculations after its first introduction in this field by Siewert and Benoist (1979). During the past six years the method has enjoyed tremendous successful application in almost all spheres of transport theory. In this sub-chapter we have introduced f_n method for non-stationary transport equation for finite medium. The resulting alzebraic equations are similar in form to stationary version of transport equations.

Sub-chapter IG : This sub-chapter is devoted to formulate generalized H-function for time-dependent radiation transfer problem in a semi-infinite atmosphere. The method employed here is due to Busbridge (1960) and Matsumoto (1976). An extension of semi-infinite transfer problem to that of finite medium naturally leads to the formulation of X'- and Y', functions. This has been done in the 2nd part of the article.

Chapter II deals with stationary problems. This chapter is divided into two sub-chapters.

Sub-chapter IIA. In this sub-chapter we have considered a multi-region transfer problem with generalized boundary conditions at all the boundaries. By only defining the various constants appeared in the boundary conditions, different transport problems can be formulated from these equations. We have solved these by employing a series expansion in space variable of unknown quantities. It is found that resulting equations contain integrals over rational functions which can be easily computed for low-order approximations.

Sub-chapter IIB : Frequency dependent stationary transport equation in a finite atmosphere is solved for complete frequency redistribution using an approach developed by Das (1978a). The approach contains a Laplace transformation with respect to space-variables and uses the theory of linear singular operators defined and studied by Mullikin (1964). The resulting solution has come out in the form of X' and Y' functions which was extensively studied by Ivanov (1973).