P r e f a c e

In the history of transport theory stationary transport problems had received much more attention than non-stationary transport problems. This may be due to presence of additional time variable in the equation of transfer. When the medium concerned becomes non-static the problem becomes much more difficult than the problems which involves stationary media. The present work is partly undertaken for the investigation of applicability of certain methods which have proved fruitfull in the field of stationary transport processes. A part(II) of this undertaken have been devoted to study certain stationary problems.

The occurrence of non-stationary transport equation in various sphares of radiative and neutron transport theory have been described in the first part of the introduction (Chapter 0) while the second part is devoted to the study of various methods that has so far been applied. Since most of these important methods had already been extensively applied during the past decades in stationary transport problems and vast literatures are available in this context, we have omitted any such introductory remarks on stationary transport problems.

One of the major achievements in stationary transport theory is the reduction of most of the problems in semi-infinite and finite media to expressions involving H' and X'

and Y' functions. After the discovery of this functions (Ambertzumian, 1943; Chandrashekhar, 1960) numerous authors solved various problems in both stationary radiative and neutron transfer problems. A good deal of work have also done in the past for numerical evolutions of these functions for different problems in transport theory. However, this is not the situation for non-stationary transport problems. Only a limited number of investigations were carried out to develop the above mentioned processes of reduction. In the present work (Chapter I) we have devoted much of the space to develop such processes using various approaches that were found fruitful in dealing with stationary transport problems of same nature. Nonlinear integral equations were develop for X' and Y' function for different cases of interest. The reduction to H' function is made only for a single case using Busbridges (1960) technique of N-series.

During the recent past, a very good semi-approximate technique (F_n method) was developed and applied on numerous transport problems with beautiful results. In the present work a sub-chapter is devoted for application of this technique in non-steady state transport problems. No numerical evolution is presented due to lack of space.

A sub-chapter is devoted to develop the equations that governs the defuse radiation fields in terms of scatterings and transmission functions for a planetory atmospheres.

Some stationary transport problems are dealt in Chapter-II in the first place we have considered a transport problem in a multiregion media with generalise boundary conditions.

The problem is solved by expressing the un-known functions in a series of space variables having un-known coefficients dependent on angle variable. This treatment is motivated from the fact that approximate treatments in angular variables needs high order approximation.

The 2nd case considered in this chapter is a noncoherent scattering of radiation in an isotropic medium with complete frequency redistribution. The equation of transfer for diffuse radiation fields for a finite medium has been solved by Laplace transform and linear singular operators. The solution has been expressed in terms of X' and Y' functions for the relevant problems.

I should like to express my sincere thanks and gratitude to Prof. S. Karanjai who superised and criticized the whole work. I am also grateful to U.G.C. authority for financial support from Nov. 1982 to June, 1985.

Dated : 6.3.89

Goutam Kumar Biswas,
Department of Mathematics,
North Bengal University,
Raja Rammohunpur - 734 430,
Dist. Darjeeling (W. B.)