ABSTRACT

The radiative transfer equation is an integro-differential equation and general solution to this problem is difficult to develop because of the complex mathematical form of the governing equation. Several different methods have been developed over the years, some of which have been exact but many of them have been approximate. Among the various approximate methods, SHM is most tedious but elegant method. A double interval spherical harmonic method is used to solve interlocked multiplets and other problems in radiative transfer.

In this method, the form of intensity are taken as

$$I_r^+(\tau,\mu) = A\tau + \sum_{l=0}^{l_0}(2l+1)I_{rl}^+(\tau)\mu P_l(2\mu-1)\ ,\ 0 \le \mu \le 1 \qquad r = 1, 2....$$

$$I_r^-(\tau,\mu) = A\tau + \sum_{l=0}^{l_0}(2l+1)I_{rl}^-(\tau)\mu P_l(2\mu+1)\ ,\ -1 \le \mu \le 0 \qquad r = 1, 2....$$

where A is some constant to be determined.

In chapter 2, problem of interlocked doublet in isotropically scattering atmosphere is considered and solved by means of double interval spherical harmonic method (DISHM).Throughout this chapter we have used this particular form of intensity and obtained the results for first and second approximation and the constant A is determined.

In chapter 3, interlocked triplet problem is considered and solved by DISHM. Here also we used the same form of intensity and obtained various results.

In chapter 4, problem in plane parallel thin atmosphere is considered and solved by DISHM. Here we used the above form of intensity and calculated the various results with the phase functions like (i) Rayleigh (ii) General phase function (iii) Henyey-Greenstein (iv) Pomraning phase function for first and second approximation.

In chapter 5, we have solved the transfer equation considering Carlstedt and Mullikin's phase function taking the above said form of intensity and calculated emergent intensity, law of darkening and the constant A.

Finally in chapter 6, we have studied different approximate forms of H-functions for anisotropic scattering particularly for Carlstedt and Mullikin's phase function.