Computer Code Abstracts

MIST

1. Name of Code: MIST.
2. Computer for which Code is designed: IBM 7090. Programming System: FORTRAN II.
3. Nature of Problem Solved:

   Obtains the solution to the one-dimensional Boltzmann equation in slab geometry. The numerical approximation used is a linear one which can be described as an extension and generalization of the S_n approximation. The equations are formulated in terms of a "double S_n" approximation and the solution is obtained by a *direct method* (one requiring no inner iterations).

   The boundary conditions for each group may be independently specified and permit very general specifications with respect to:

   (a) Perfect mirror reflection or symmetry (by input of mirror albedos).

   (b) Anisotropic diffuse sources (by input of Legendre polynomial coefficients (up to $l = 9$) or a short table describing a known angular distribution of the flux).

   (c) Isotropic (Lambert surface) reflection.

   Isotropic volume sources in each group may also be independently specified. The scattering from one group to another is assumed to be isotropic but the scattering function within each group can be a second order Legendre polynomial series.
4. Restriction on the complexity of the problem:

   In order to maintain the maximum flexibility, the MIST program is divided into four separate codes. The limit on the number of spatial and angular mesh points for each code is as follows:

Code	Maximum number	
	Angular intervals	Space points
MIST 4	4	250
MIST 6	6	150
MIST 8	8	100
MIST 10	10	70

Maximum number of energy groups	6
Maximum number of regions	40
Maximum number of materials	40
Maximum number of downscatter groups	5

   Machine Requirements: 32K memory, 5 tape units
5. Typical running times: 2 group, 69 point problem requiring six outer iterations to pointwise convergence of 0.001:

Angular intervals	Time (min)
2	0.58
4	1.03
6	1.68
8	2.52
10	3.56

   Problems which require no outer iterations will take a maximum of ~ one minute.
6. Availability: Production; available upon receipt of magnetic tape. Contact D. M. Shapiro.
7. *Reference:* D. M. Shapiro *et al.* "MIST" (Multigroup Internuclear Slab Transport), INTERNUC 67, August 18. 1961. Work performed for Phillips Petroleum Company Atomic Energy Division under Contract AT(10-1) 205, subcontract C-222.

D. M. Shapiro
Internuclear Company
Clayton, Missouri

GREEN

1. Name of code: GREEN.
2. Computer for which code was designed: IBM 704; programing system: FORTRAN II.
3. Nature of problem solved: Calculation of the spatially dependent coefficients of the spherical harmonic expansion of the scalar one speed neutron flux around a point source of arbitrary anisotropy in an infinite homogeneous scattering and absorbing medium. The code will also calculate the first order correction to the coefficients caused by nonisotropic scatter.
4. Restrictions on the complexity of the problem: In its present version it calculates the coefficients for distances from the source of from 0 to 10 cm in steps of $\frac{1}{6}$ cm. Coefficients for spherical harmonics from zeroth to fifth order may be calculated. Machine requirements: 8K memory.
5. Typical running time: 2 min per space point per value of the spherical harmonic index.
6. Unusual features of the code: The program provides an automatic method of calculation of the Green's function coefficients for the thermal neutron flux depression problem discussed in the next abstract.
7. Present status: In use on Oak Ridge Gaseous Diffusion Plant Central Data Processing's IBM 7090. Available in standard FORTRAN II language.
8. *References:* G. R. Dalton, Some Aspects of Thermal Neutron Detectors, Thesis, University of