Computer Code Abstract

TASK

A Generalized One-Dimensional Transport and Diffusion Kinetics Code

1. Name of Code: TASK.
2. Computer: TASK is designed for computers in the IBM-360 series. A preliminary version of the program has been made operational on a CDC-6600.
3. Nature of Physical Problem Solved: TASK solves the one-dimensional multigroup form of the reactor kinetics equations using either transport or diffusion theory allowing an arbitrary number of delayed neutron groups. TASK can also be used to solve standard statics problems efficiently such as eigenvalue problems, distributed source problems, and boundary source problems.
4. Method of Solution: TASK employs a combination scattering and transfer matrix method in order to eliminate certain difficulties which arise in classical finite difference approximations. Within-group (inner) iterations are eliminated and solution convergence is independent of spatial mesh size. Convergence problems associated with sources in highly multiplicative media are circumvented and such problems are readily calculable. The time variable is removed by Laplace transformation. The code can be run either in an outer iteration mode or in closed (non-iterative) form. The running mode is dictated by the number of groups times the number of angles consistent with available storage.
5. Restrictions in the Complexity of the Problem: Principal restrictions are available storage and computation time. The code is flexibly dimensioned and has an outer iteration option which means that there are no internal restrictions on group structure, quadrature, and number of ordinates. The generalized cylindrical geometry option is not complete in this version of the code. The feedback options and omega-mode search options are not included in this version of the code.
6. Typical Running Times: A typical 13-region 5-group S_4 fast reactor static distributed source problem requires approximately $\frac{1}{2}$ min on the IBM-360/91, whereas the entire kinetic response can be computed in 8 to 10 min. A 16-group S_{16} static 125-cm iron slab shielding problem with a boundary source requires about 4 min computation time.
7. Unusual Features of the Code: The flexible dimensioning scheme allows optimal use of core storage.
8. Related and Auxiliary Programs: An auxiliary program exists which reads a TASK flux tape and computes an arbitrary number of detector responses at selected points in the system and produces both the cross and auto power spectra for any combination of detector pairs or single detectors. A later version of the code will allow direct time solutions.
9. Status: In use on the IBM-360 machines.
10. Machine Requirements: TASK requires 154 K of storage plus data block storage to execute on the IBM-360/91. One tape is required if fluxes are needed for later analysis.
11. Programming Language Used: FORTRAN IV, IBM FORTRAN 4 Compiler.
12. Operating System: IBM-360 OS Level 20.1 Operating System.
13. Other Programming or Operating Information or Restrictions: None.
14. Material Available: The code and documentation may be obtained through the Argonne Code Center at Argonne National Laboratory or the Radiation Shielding Information Center at Oak Ridge National Laboratory.
15. Acknowledgment: Research sponsored by the U.S. Atomic Energy Commission under contract with Union Carbide Corporation.
16. *References:*

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[3]H. L. DODDS, Jr., "A New Calculational Method for Space-Energy-Angular-Dependent Reactor Kinetics," ORNL-TM-3136, Oak Ridge National Laboratory (1971).

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