Computer Code Abstracts

DP_N Roots

1. Name of Code: DP_N ROOTS
2. Computer for Which Program is Designed: IBM-709 and -7094.
   Programming Language: FORTRAN II.
3. Nature of Problem Solved: This code will calculate the $2N + 2$ characteristic analytic roots of the double P_N representation of the neutron transport equation. The pair of imaginary roots that occur for $c > 1$ are correctly treated. In addition, the code calculates all of the coupling coefficients of each characteristic solution that relate the higher angular moments to the zeroth moments.
4. Method of Solution: A general recursion relation is used to generate the coupling coefficients. These are used to form the general N'th-order characteristic equation. This equation is then solved for the $2N + 2$ roots by a cut-and-try process followed by an iterative procedure to coverage on the root. All roots will be found since the branch cuts in the root curve are all known, and the cut-and-try process is restricted successively to the space between pairs of branch cuts.
5. Basic Physics Approximations: One group, isotropic scatter, homogeneous medium, homogeneous (no source) transport equation, and double P_N approximation to the neutron transport equation.
6. Restrictions on Complexity: Any order of approximation N is available up to 100; however, only the branch-cut locations for $N < 21$ are currently at hand.
7. Running Time: One-tenth of a minute per case, 709.
8. Unusual Features: The code calculates the numerical value of the imaginary roots by an explicitly real process. It also calculates the (2×2) matrix of coupling coefficients for the associated cosine-sine solution pair by an explicitly real process.
9. Status: In production.
10. *References:*
    1. S. Ziering and D. Schiff, "Yvon's Method for Slabs," *Nucl. Sci. Eng.*, **3**, 635 (1958).

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WIGL2

1. Name of Program: WIGL2
2. Computer for Which Program is Designed: Philco 2000
   Programming System: FORTRAN
3. Nature of Problem Solved: WIGL2 is a one-dimensional two-group space-time diffusion-theory program with six delayed-neutron groups. The program will take care of slab, cylindrical, and spherical geometries and includes nonboiling heat transfer. It accounts for xenon feedback and feedback effects due to fuel and coolant temperature. Control rod motion and control system feedback based on total core power or outlet coolant temperature can be simulated. Transients may be excited by prescribed changes in inlet coolant temperature, coolant flow rate, or rod position.
4. Present Status: In Use.
5. *References:*
   1. W. R. Cadwell, A. F. Henry and A. J. Vigilotti, "WIGLE—A Program for the Solution of the Two-Group Space-Time Diffusion Equations in Slab Geometry," WAPD-TM-416, (January 1964).
   2. A. F. Henry and A. V. Vota, "WIGL2—A Program for the Solution of the One-Dimensional, Two-Group, Space-Time Diffusion Equations Accounting for Temperature, Xenon, and Control Feedback," WAPD-TM-532, (October 1965).

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