NUCLEAR SCIENCE AND ENGINEERING: **13,** 63 (1962)

Computer Code Abstracts

TWENTY GRAND

1. Name of code: TWENTY GRAND.
2. Authors: M. L. Tobias and T. B. Fowler.
3. Computer for which code designed: IBM-7090.
   Programming system: FORTRAN.
4. Nature of problem solved: Few-group, two-dimensional, neutron diffusion equations in cylindrical or slab geometry.
5. Restrictions on the complexity of the problem:
   Maximum number of groups—6
   Maximum number of mesh points—3000
   Maximum number of compositions—50
   Maximum number of regions—100.
6. Typical running times: approximately 0.0035 sec per point per iteration per group; about 30 min for a 1000-point four-group problem.
7. Unusual features of the code: Neutron transfer from any group to any group is permitted. The logarithmic derivative boundary condition is allowed, and the adjoint flux option is available.
8. Present status: In use, available.
9. *References:* Melvin L. Tobias and T. B. Fowler, The TWENTY GRAND program for the numerical solution of few-group neutron diffusion equations in two dimensions. ORNL-3200 (December, 1961).

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EQUIPOISE-3

1. Name of code: EQUIPOISE-3.
2. Authors: T. B. Fowler and M. L. Tobias.
3. Computer for which code is designed: IBM-7090.
   Programming system: FORTRAN.
4. Nature of problem solved: Two-group, two-dimensional, neutron diffusion equations in cylindrical or slab geometry.
5. Restrictions on the complexity of the problem:
   Maximum number of groups—2
   Maximum number of mesh points—2100
   Maximum number of compositions—50
   Maximum number of regions—100.
6. Typical running times: approximately 0.0017 sec per point per iteration; about 5 min for a 1000-point problem.
7. Unusual features of the code: This code is intended to fill the need for a rapid two-dimensional program suitable for survey calculations. Magnetic tapes are used only for input, output, and program storage. The logarithmic derivative boundary condition is allowed. Adjoint fluxes and volume integrals of the products of fluxes and their adjoints may be calculated automatically if desired.
8. Present status: In use, available.
9. *References:* T. B. Fowler and M. L. Tobias, *EQUIPOISE-3:* A two-dimensional, two-group neutron diffusion code for the IBM-7090 computer. ORNL-3199 (December, 1961).

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2DGH

1. Name of code: 2DGH.
2. Computer for which code is designed: IBM-7090.
   Programming system: FORTRAN.
3. Nature of problem solved: Calculation of gamma ray heating dose at a target point within a cylindrical reactor, using a source calculated by EQUIPOISE-3.
4. Restrictions on the complexity of the problem:
   Nuclear calculation—Equipoise-3, r-z geometry
   2 groups
   99 increments in r direction } maximum
   99 increments in z direction }
   Gamma heating
   50 regions
   7 energy groups
   Machine requirements: 4 tape units (input, output, source, and data storage).
5. Typical running time: About 0.06 sec per point, where the number of mesh points is the product of the number of mesh points in the nuclear calculation times the number of increments in the θ direction.
6. Unusual features of the code: This program is an extended and improved version of NIGHTMARE (ref. *1*) with a larger number of mesh points and a two-dimensional material arrangement permitted.
7. Present status: In use, available.
8. *References: 1.* Abstract No. 2, *Nuclear Sci.* and *Eng.* **9,** 101 (1961).
   2. ORNL report being written.

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