Computer Code Abstracts

AIMFIRE

1. Code Name: AIMFIRE
2. Computer for which code is designed: IBM 704, 709, 7090
   Programming system: FORTRAN II
3. Nature of problem solved: Calculation of costs in fixed length multicycle fuel reprocessing. The code solves the zero-dimensional reactor criticality and isotope equations. At the end of a preassigned fuel exposure, fission products are removed according to specified removal fractions, the fuel is re-enriched according to one of several options, and the cycle is repeated.
4. Restrictions on the complexity of the problem:
   Maximum number of isotopes = 100
   Uranium fuels
   Machine requirements: 8K 704, 709 or 7090 and 8 tape units
5. Unusual features of the code: The code will search for the enrichment of the reprocessed fuel which will give the same initial (final) reactivity as calculated for the beginning (end) of the first cycle.

   In the cases investigated to date it was found that for fixed initial reactivity the final reactivity was in excess of that needed for control; thus the search for fixed final reactivity assures optimum fuel utilization. Heterogeneous effects (thermal spectrum, disadvantage factors, etc.) are varied through fitting constants supplied as input data obtained by calculating the effects for several values of the fuel absorption and fitting to a quadratic. A later version will incorporate FORM, TEMPEST, and an S_n cell code. A library of isotopic cross sections, fission yields, and decay constants for 50 isotopes is available.
6. *Reference:* R. A. Blaine, AIMFIRE—A fuel economics code. NAA-SR-6706 (September 1961).

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KERNMAT

1. Code name: KERNMAT
2. Computer for which code is designed: IBM-7090, adaptable to IBM-704
   Programming system: FORTRAN II
3. Nature of problem solved: Effective multiplication factor and relative power distribution at fuel assemblies by the heterogeneous method or small source theory of reactor calculations. Fuel assemblies that are fully equivalent to each other within the heterogeneous lattice form a "rod type." Coordinate specification of every pair of rods for all the rod types must be entered. For rectangular lattices, a separate routine, DECART, is available for coordinate grid generation.
4. Restrictions on the complexity of the problem: A maximum of 36 rod types is available. Thermal age-diffusion kernels or their linear combination up to three terms corresponding to infinite line source-sinks in an infinite moderator are assumed, with all resonance absorptions-fissions in fuel lumped at one energy. Machine requirements: 32 K memory, 3 intermediate tapes, input-output tapes under Fortran Monitor.
5. Typical running times: 1 to 5 min, depending upon problem size/options.
6. Unusual features of the code: Coordinate, kernel and/or matrix intermediate data can be written on and read from auxiliary tapes for use in subsequent problems.
7. Present status: Production; source deck/listing of the main program and all the functions and matrix operations subroutines or object deck available.
8. *Reference:* S. A. Raje; KERNMAT, A FORTRAN code for the heterogeneous method of reactor calculations. CVNA-107 (September 1961).

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