

PACKAGE ID - 000337C017500 PDQ7

KWIC TITLE - 1,2 or 3-D Few-Group Diffusion Depletion

AUTHORS - Pruitt, S.J.
Boeing Computer Services, Richland, WA (United States)

LIMITATION CODE - UNL **AUDIENCE CODE** - USSO

COMPLETION DATE - 08/01/1980 **PUBLICATION DATE** - 12/01/1982

DESCRIPTION - The PDQ series of programs is designed to solve the neutron diffusion-depletion problem in one, two or three dimensions. The three-dimensional spatial calculation may be either explicit or discontinuous trial function synthesis. Up to five lethargy groups are permitted. Adjoint, fixed source, one iteration, additive fixed source, eigenvalue, and boundary value calculations may be performed. The programs utilize the HARMONY system for time-dependent representation of cross section variation and generalized depletion chain solutions. Geometries available include rectangular, cylindrical, spherical, and hexagonal. All allow variable mesh in all dimensions. Various control searches as well as temperature and xenon feedback are provided.

PACKAGE CONTENTS - NESC Note; Software Abstract; WAPD-TM-974(L); INEL transmittal of PDQ7 version 2;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 1 Mag Tape

METHOD OF SOLUTION - The group equations are solved directly using Gaussian elimination in one dimension, by single-line cyclic Chebyshev semi-iterative method in two dimensions, and by the single-line successive overrelaxation method in three dimensions. Source iterations are accelerated by use of Chebyshev extrapolation. The synthesis solution utilizes the axially discontinuous trial function formulation and solves the iterative problem by use of the Weilandt method. The feedback capabilities are implemented by utilizing a system of time-dependent cross sections and generalized depletion chains.

COMPUTER - CYBER175

OPERATING SYSTEMS - NOS 1.2 (CDC CYBER175); SCOPE 2.1.4 (CDC7600)

PROGRAMMING LANGUAGES - FORTRAN IV and COMPASS

SOFTWARE LIMITATIONS - The total number of groups is limited to five, although six equations may be solved if the P(3) option is used. All storage is dynamic so no fixed problem size limits are imposed.

SOURCE CODE AVAILABLE (Y/N) - Y

PACKAGE ID - 000337C017500 PDQ7

RELATED SOFTWARE - The water properties required for thermal feedback calculations are obtained from a package of subroutines described in reference 3. The Boeing CDC CYBER175 version of PDQ7 contains necessary BETTIS ENVIRONMENTAL LIBRARY routines.

HARDWARE REQS - On CDC systems the central memory size should be at least 65K, and the program will utilize up to 1000K of extended core memory and up to four disks transferring in parallel.

TIME REQUIREMENTS - PDQ7 running time in hours on a CDC6600 may be estimated by dividing the product of groups and points by 150,000.

REFERENCES - W.R. Cadwell, Ed., Reference Manual - Bettis Programming Environment, WAPD-TM-1181, September 1974; L.L. Lynn, A Digital Computer Program for Nuclear Reactor Design Water Properties, WAPD-TM-680, July 1967; W.R. Cadwell, PDQ-7 Reference Manual, WAPD-TM-678, January 1967; R.J. Breen, O.J. Marlowe, and C.J. Pfeifer, HARMONY - System for Nuclear Reactor Depletion Computation, WAPD-TM-478, January 1965; C.J. Pfeifer, PDQ-7 Reference Manual II, WAPD-TM- 947(L), February 1971; C.J. Pfeifer, CDC-6600 FORTRAN Programming - Bettis Environmental Report, WAPD-TM-668, January 1967; PDQ7, NESC No. R275.C175, PDQ7 CYBER175 Nos Version Transmittal Tape Description and Implementation Information, National Energy Software Center Note 80-58, August 12, 1980\ PDQ7, ACC No. R275.7600, Argonne Code Center Note 78-4, November 1, 1977; R.J. Wagner, INEL Transmittal of PDQ7 Version 2, INEL Note, January 21, 1977; R.J. Wagner, FAPFIM - Fortran Access to Permanent File Macros, INEL Note, October 11, 1976.

ABSTRACT STATUS - CDC6600 KRONOS (Boeing) version of PDQ7 submitted July 1973, replaced August 1980 by CDC CYBER175 NOS version of PDQ7 submitted April and August 1980.

SUBJECT CLASS CODE - D

KEYWORDS -

COMPUTER PROGRAM DOCUMENTATION
P CODES
NEUTRON DIFFUSION EQUATION
MULTIGROUP THEORY
BURNUP
ITERATIVE METHODS
CYLINDERS
SPHERES
SYNTHESIS
HEXAGONAL CONFIGURATION

EDB SUBJECT CATEGORIES -

990200 663610 220100

SPONSOR - DOE/DP

PACKAGE TYPE - AS - IS