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DOS-Heating6: A General Conduction Code with Nuclear Heat Generation Derived from DOT-IV Transport Calculations

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DOS-HEATING6: A GENERAL CONDUCTION CODE WITH NUCLEAR HEAT GENERATION DERIVED FROM DOT-IV TRANSPORT CALCULATIONS

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ABSTRACT

The HEATING6 heat conduction code is modified to (a) read the multigroup particle fluxes from a two-dimensional DOT-IV neutron-photon transport calculation, (b) interpolate the fluxes from the DOT-IV variable (optional) mesh to the HEATING6 control volume mesh, and (c) fold the interpolated fluxes with kerma factors to obtain a nuclear heating source for the heat conduction equation. The modified HEATING6 is placed as a module in the ORNL discrete ordinates system (DOS), and has been renamed DOS-HEATING6. DOS-HEATING6 provides the capability for determining temperature distributions due to nuclear heating in complex, multi-dimensional systems. All of the original capabilities of HEATING6 are retained for the nuclear heating calculation; e.g., generalized boundary conditions (convective, radiative, finned, fixed temperature or heat flux), temperature and space dependent thermal properties, steady-state or transient analysis, general geometry description, etc.

The numerical techniques used in the code are reviewed and the user input instructions and JCL to perform DOS-HEATING6 calculations are presented. Finally a sample problem involving coupled DOT-IV and DOS-HEATING6 calculations of a complex space-reactor configuration is described, and the input and output of the calculations are listed.

Section 1.0 INTRODUCTION

Energy deposition due to neutron and gamma interactions with structural and shielding materials is a recognized concern in designing many nuclear power systems. The temperature distribution arising from this "nuclear heating" source can cause severe thermal stresses and, in extreme cases such as in space-based reactors, the temperature can actually approach the melting point of vital components. In order to compute the temperature distribution, two steps are required. First, a particle transport calculation is performed to obtain the space and energy distribution of the neutron and/or gamma fluxes. Second, the fluxes are folded with kerma factors to determine the volumetric heat source which is input to a heat conduction calculation. The output of the conduction calculation is checked to make sure that all thermal constraints are met. If not, then a design modification is made, and the procedure repeated.

The Discrete Ordinates System (DOS) [1] at Oak Ridge National Laboratory (ORNL) provides the capability of performing detailed transport calculations of very complex systems. The DOT-IV [2] program is a two-dimensional, multigroup discrete ordinates transport code, which is a major module in this system. DOT-IV can be used to compute fluxes for evaluating the nuclear heating source; however, no modules previously existed in the DOS system to utilize the DOT output to perform the subsequent conduction calculations in order to determine the final temperature distribution.

Many sophisticated programs are currently available to solve the heat conduction equation. One of the more advanced conduction codes which is available at ORNL is HEATING6,[3] which is the latest version of the HEATING program. HEATING6 was developed under support from the U.S. Nuclear Regulatory Commission to serve as a module in the SCALE computer code system.[4] The SCALE system was designed mainly to perform safety analysis of spent fuel shipping casks; however, the individual programs in the system can be used alone or together to analyze many other types of problems. In particular, the HEATING6 program can be used as a stand-alone, heat conduction program. The following is a description of some of the capabilities of HEATING6:

"HEATING6 solves steady-state and/or transient heat conduction problems in one-, two-, or three-dimensional Cartesian or cylindrical coordinates or in one-dimensional spherical coordinates. The thermal conductivity, density, and specific heat may be both spatially and temperature-dependent. In addition, the thermal conductivity may be anisotropic. Selected materials may undergo a change of phase (i.e., melting, boiling, freezing, etc.) for transient calculations involving one of the explicit procedures. The heat generation rates may be dependent on time, temperature and position; and boundary temperatures may be dependent on time and position. Boundary conditions which may be applied along surfaces of a model include specified temperatures or any combination of prescribed heat flux, forced convection, natural convection, and radiation. Models are available to simulate the thermal fin efficiency of certain finned surfaces. In addition, one may specify radiative heat transfer across gaps or regions embedded in the model.

The boundary condition parameters may be time- and/or temperature-dependent. The mesh spacing may be non-uniform along each axis."[3]

1.1 Objectives

It can be seen that the capability is available to perform transport as well as heat conduction calculations in complex systems, using DOT-IV and HEATING6, respectively. However, prior to this work there was no automated coupling between the two calculations. Due to differences in the way that the calculational meshes are defined in DOT and HEATING6, it is impossible to define a single consistent mesh that will coincide for the transport and heat conduction calculations. Thus it is always necessary to interpolate the DOT fluxes to the appropriate HEATING6 mesh in order to compute a consistent nuclear heating source. Furthermore, because of the way HEATING6 defines its "control volumes," it is necessary to compute up to four interpolated flux values for each node in the HEATING6 mesh. Kerma factors corresponding to the different materials in each control volume can then be folded with the interpolated fluxes to obtain the final nuclear heat source at a given node. For complex geometries, computer routines must be developed to perform these tasks.

The objective of this work is to modify the original HEATING6 program, in order to:

(a) Read the DOT-IV output fluxes from a VARFLM file (including variable mesh problems)

(b) interpolate the DOT group fluxes to the midpoints of the various "subregions" which comprise the control volume about a particular node in HEATING6.

(c) read input values for the kerma factors, and fold the interpolated fluxes with kermas for the appropriate material in the subregion.

(d) sum the results of (c) over group and subregion to obtain the final nuclear heating source associated with the control volume for a given node.

(e) implement the modified version of HEATING6 as a module in the DOS system, so that coupled DOT-IV/HEATING6 calculations can be easily performed in a single job step.

The following constraints were placed on the modifications made in HEATING6 to compute the nuclear heating source:

(a) modifications can not restrict the current capabilities of the code.

(b) nuclear heating source can be present simultaneously with any external heat source presently treated by the code.

(c) the code must be "backward compatible" for all previous input decks; new input requirements must be kept to a minimum, and will use free form input procedures.

(d) new arrays are to be variably dimensioned.

The modified version of HEATING6 is now called "DOS-HEATING6".

1.2 Overview of the DOS-HEATING6 Code

The original HEATING6 code is written mostly in FORTRAN, with a few assembly-language routines used in core storage determination (e.g., ALOCAT). The program is quite large, consisting of over 100 subroutines and about 19000 lines of coding. The DOS-HEATING6 program has nine

modified routines, as well as four completely new routines, as listed in table 2.1. Essentially every array whose size is a function of the input data is variably dimensioned. The default values used to compute these variable dimensions may be overridden using the NAMELIST feature in the input data, and thus the code does not have to be recompiled each time a change is specified. Computer storage allocation for several features in HEATING6 is handled at execution time, and the values for these flags may also be overridden using the NAMELIST feature. HEATING6 uses the SCALE computer core allocation feature. Basically, it obtains the value for the total computer core requested by the user from the job control language (JCL). It then determines the amount of core required by the basic HEATING6 code (all but the variably dimensioned arrays) and the buffers for the logical units to be used. The remaining core is then reserved for the variably dimensioned arrays.

The card input data for DOS-HEATING6 uses free-form reading subroutines and is subdivided into data blocks identifiable by keywords. Data items or blocks may be added, modified or deleted from the input data stream for the current model or from the previously defined model making parametric studies easy. DOS-HEATING6 will read the input data for a case until it encounters an end-of-case indicator. It checks the input data for errors and inconsistencies and issues messages clearly identifying any data problems that may be encountered. Some data errors are fatal and cause processing to be terminated immediately. However, most errors will allow the input data processing to continue for the case but will not allow the case to be executed. This results in the code locating all or most of the input data errors with one execution. If no input data errors are encountered, DOS-HEATING6 will proceed with

Table 1.1 HEATING6 Code Modifications

Modified Subroutines	New Subroutines
HEATN6	DOTR
INPUT	DOTQ
MAIN	TERP
READER	DWOT
MATERL	
CALQLT	
TRANO	
DIRECT	
DIFFER(*)	

(*) Corrected error in original coding; DTAN (1.0D0) changed to DATAN (1.0D0)

the specified calculations for the case. If input data errors are encountered or if the calculations for the case are completed, the code starts reading input data for the next case. If a case relies on data from the previous case, the new case will not be executed unless the previous case terminated successfully.[3]

A brief description of the numerical techniques used in DOS-HEATING6 is given in Section 2 of this report. Section 3 describes the terminology for problem specifications, and gives the input description. Section 4 illustrates a sample calculation involving coupled DOT-IV/HEATING6 runs to determine the temperature distribution in a space-reactor shield.

Section 2.0 CALCULATION METHODOLOGY

A detailed description of the numerical methods used in HEATING6 to solve the steady state or transient heat conduction equation is given in Section F10.2.1 of the HEATING6 documentation, contained in Vol. II of the SCALE reports.[4]

Some of this section was taken directly from that report with appropriate alterations to reflect the specific problem addressed by DOS-HEATING6 of how to compute the heat source due to nuclear heating, utilizing the flux output from a DOT-IV neutron/photon transport calculation. Only an outline of the modifications made to HEATING6 to provide capability for computing the nuclear heat source is given here. A more detailed description, including a listing of the new subroutines appears in Reference 5.

2.1 HEATING6 Numerical Technique

The HEATING6 program solves the steady-state or transient heat conduction problem in either one, two, or three dimensions for either Cartesian or cylindrical coordinates or in one dimension (radial) for spherical coordinates. For illustrative purposes, the general equations and the discussion which follow are written for a three-dimensional problem in Cartesian coordinates. However, the present nuclear heating source calculation in DOS-HEATING6, which is based on the two-dimensional DOT-IV flux output, is actually limited to RZ, RΘ, or XY geometries and steady state cases.

First, the physical problem is approximated by a system of nodes each associated with a small control volume. In order to define the nodes, a system of orthogonal planes is superimposed on the problem. The planes may be unequally spaced, but they must extend to the outer boundaries of the problem. A typical internal node, which is defined by the intersection of any three planes is depicted in Fig. 2.1. Heat may flow from a node to each adjacent node along paths which are parallel to each axis. Thus for a three-dimensional problem, heat may flow from an internal node to each of its six neighboring nodes. The system of equations describing the temperature distribution is derived by performing a heat balance on the control volume associated with each node.

The finite difference heat balance equation for the control volume around node o in Fig. 2.1 is

$$C_o \frac{T_o^{n+1} - T_o^n}{\Delta t} = P_o^n + \sum_{m=1}^{6} {}_oK_m (T_m^n - T_o^n) \tag{2.1}$$

where T_m^n is the temperature of the mth node adjacent to node o at time t_n, ${}_oK_m$ is the conductance between nodes o and m, C_o is the heat capacitance of the material associated with node o, and P_o^n is the heat generation rate in the latter material at time t_n. In general, the heat generation rate will be composed of an external heat source, as discussed in the original HEATING6, plus a "nuclear heat source" arising from the energy deposition of neutrons and/or photons which interact with the materials comprising the node. Therefore, the total heat generation rate for node o can be written as follows:

$$P_o^n \equiv (P_o^n)_E + (P_o)_N \tag{2.2}$$

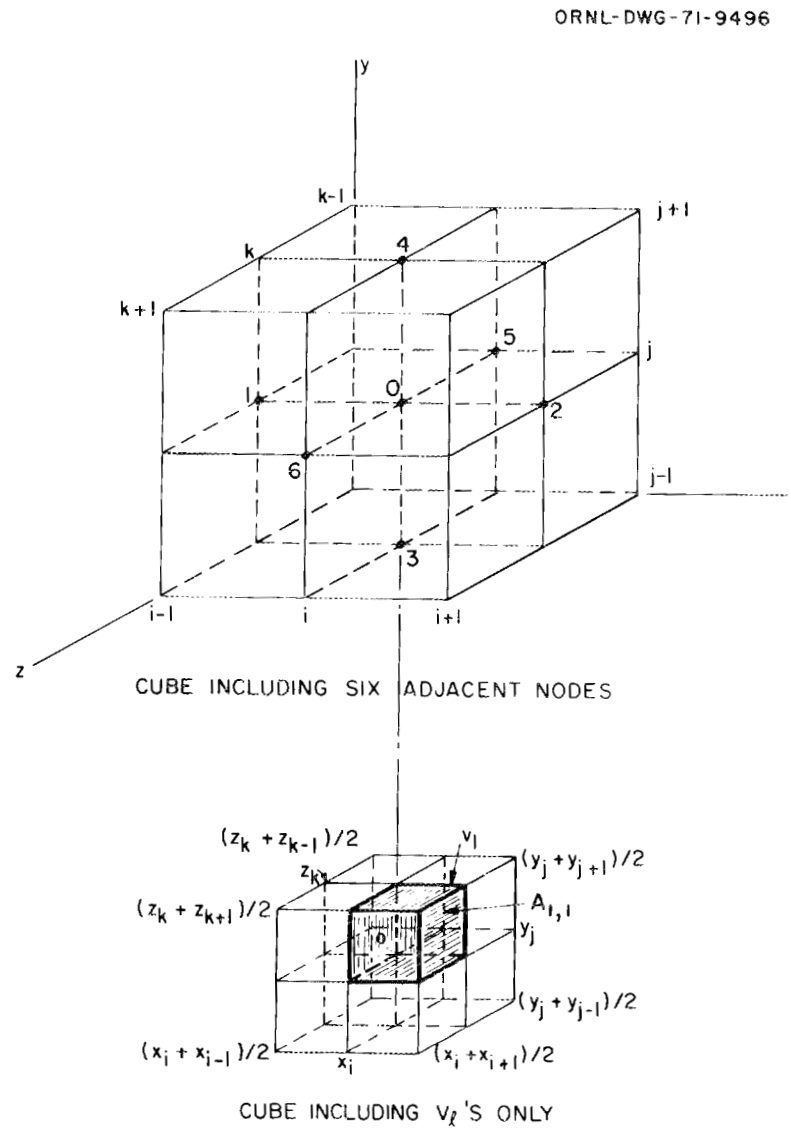

Fig. 2.1. Nodal Description for Three-Dimensional Problem

where $(P_o^n)_E \equiv$ external heat sources at time t_n

$(P_o)_N \equiv$ nuclear heat source (time-independent) computed from DOT output flux.

With reference to Fig. 2.1, the V_ℓ's (sub-region volumes) and $A_{m\gamma}$'s (subregion areas) are defined, by using examples, as follows:

$$V_\ell = \frac{(X_{i+1} - X_i)}{2} \frac{(Y_{j+1} - Y_j)}{2} \frac{(Z_{k+1} - Z_k)}{2} \tag{2.3}$$

$$A_{1,1} = \frac{(Y_{j+1} - Y_j)}{2} \frac{(Z_{k+1} - Z_k)}{2} \tag{2.4}$$

The expressions for computing values of C_o, P_o^n, and ${}_oK_m$ associated with node "o" are given in section F10.2.1 of the SCALE HEATING6 report; however, in this report we are only concerned with the expression for the node heat generation rate, given by

$$P_o^n = \sum_{\ell=1}^{8} Q_\ell^n V_\ell, \tag{2.5}$$

where Q_ℓ^n is the heat generation rate per unit volume in subregion ℓ of node o, at time step n. As shown in Eq. 2.2, P_o^n in DOS-HEATING6 is composed of an external and a nuclear heat source, so that there will be a corresponding volumetric heat generation rate for each of these contributions:

$$Q_\ell^n = (Q_\ell^n)_E + (Q_\ell)_N \tag{2.6}$$

with

$$(P_o^n)_E = \sum_{\ell=1}^{8} (Q_\ell^n)_E \, V_\ell \tag{2.7}$$

$$(P_o)_N = \sum_{\ell=1}^{8} (Q_\ell)_N \, V_\ell \tag{2.8}$$

The volumetric nuclear heat source $(Q_\ell)_N$ is calculated from the neutron/photon flux output of the DOT transport code as discussed in Section 2.2.

Nodes lying on a surface or nodes from one- or two-dimensional problems will not necessarily have six neighbors, as do internal nodes. The general heat balance equation for the control volume about node i having M_i neighbors can be written as

$$C_i \frac{T_i^{n+1} - T_i^n}{\Delta t} = P_i^n + \sum_{m=1}^{M_i} {}_i K_{\alpha_m} (T_{\alpha_m}^n - T_i^n) \quad , \tag{2.9}$$

where α_m is the mth neighbor of the ith node. These nodes will also not necessarily contain eight subregions, so that the general form of the heat generation rate associated with node "i" is

$$P_i^n = \sum_{\ell=1}^{L_i} Q_\ell^n \, V_\ell \ , \tag{2.10}$$

where $L_i \equiv$ number of subregions associated with node "i".

For a steady-state conduction problem, the heat balance equation for an arbitrary node i reduces to

$$P_i + \sum_{m=1}^{M_i} {}_iK_{\alpha m}(T_{\alpha m} - T_i) = 0 \tag{2.11}$$

since the left-hand side of Eq. 2.1 is zero.

If there are I node points, there will be a system of I equations with I unknowns since Eq. (2.11) will be applied at each node. HEATING6 contains two techniques for solving the resulting system of equations. The first technique involves point successive overrelaxation (SOR) iteration combined with a modification of the "Aitken δ^2 extrapolation process." This method can be used for any steady-state problem modeled with DOS-HEATING6. However, for certain classes of problems convergence may be slow or the convergence criterion may be unreliable since it only requires that the maximum relative change in temperature from one iteration to the next be less than the specified value. In other words, the steady-state temperature distribution could change significantly as the convergence criterion is decreased in magnitude. Such difficulties can arise in problems with widely varying parameters such as thermal conductivity, grid spacing along an axis, or nonlinear boundary conditions. Thus, a second technique is available to HEATING6 to solve the steady-state system of equations using a direct solution technique. The direct solution technique is available only for one- and two-dimensional problems, and even then it is not always more efficient than the successive overrelaxation method since it can require a large amount of core. This can occur for two-dimensional calculations when the problem requires a large number of lattice lines along the X (or R) axis, or when the problem requires heat transfer across a gap along the

Y (or Θ) or Z axes. However, it can be much faster and more reliable than the successive overrelaxation technique for many problems.

2.2 Calculation of Nuclear Heat Generation Rate from DOT Fluxes

As shown in the previous section, the total nuclear heat sources for the control volume around a node is found by summing the heat generated within each subregion of the node control volume. This in turn is found by multiplying the volumetric heat source for the subregion by the subregion volume.

Recall that the control volume associated with a given node may contain more than one material, if the node happens to lie on an interface; however, the composition of each subregion in the node is uniform. In a three-dimensional problem an internal node (i.e., one which does not lie on an outer boundary or an internal gap boundary) is composed of eight subregions; however, in two-dimensional problems an internal node contains only four subregions. Boundary nodes will contain fewer subregions. The nuclear heating source calculation in DOS-HEATING6 is presently limited to two-dimensional problems, though it would be straightforward to extend the capability to three-dimensions. The reason for the two-dimensional restriction is the fact that the DOT transport calculation is limited to XY, RZ or RΘ geometry.

As shown in Eq. 2.8 the nuclear heat source is obtained from the volumetric nuclear heat source $(Q_\ell)_N$. For subregion "ℓ" the volumetric nuclear heat source is calculated based on the DOT flux output using the expression:

$$(Q_\ell)_N = \sum_{g=1}^{IGM} \overline{\phi}_{g,\ell} \; \Sigma_{g,\ell} \qquad (2.12)$$

where $\overline{\phi}_{g,\ell}$ is the average flux in subregion ℓ, for energy group g, ((neutrons or gammas)/(cm^2-sec))

$\Sigma_{g,\ell}$ is the kerma factor corresponding to the material in subregion ℓ for energy group g (Joules/cm), and

IGM is the number of groups used in the DOT calculation.

The mesh used in the DOT transport calculation does not correspond to the mesh used in the DOS-HEATING6 calculation; therefore, the value of the average flux within a subregion must be obtained by interpolating the fluxes on the DOT output VARFLM file. The fluxes must be interpolated to the center of each subregion volume associated with a given node in HEATING6. In two-dimensional geometry this requires that four interpolations be performed for each internal node, as shown in Figure 2.2.

Note that the fluxes are spatially continuous, so that a simple two-dimensional linear interpolation is used to obtain the average flux in each subregion. The kerma factors are discontinuous at material interfaces, and in general can vary among the four sub-regions comprising a node, as shown in Figure 2.2. The interpolation routine which was developed for DOS-HEATING6 allows for a "variable mesh option" to be utilized in the DOT transport calculation, whereby the number and distribution of I meshes can vary with the J mesh. The HEATING6 calculation, however, only has fixed-mesh capability. All information needed to define the DOT mesh employed in the transport calculations is obtained directly from the DOT output VARFLM file, so that none of this information must be entered as part of the DOS-HEATING6 card input by the user.

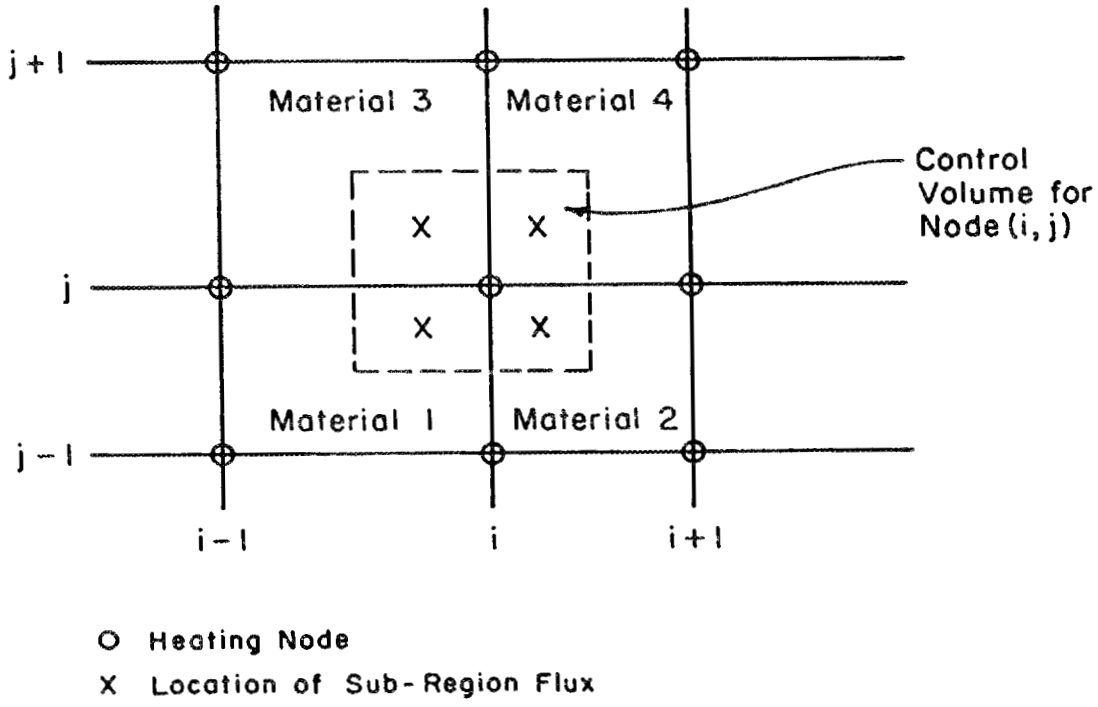

Figure 2.2 Control Volume and Sub-Regions for HEATING6 Internal Node

Section 3.0 INPUT DESCRIPTION FOR DOS-HEATING6

One of the objectives in developing the DOS version of HEATING6 was to minimize the changes to the basic input requirements; thus, the input description for the DOS version is essentially the same as the original SCALE version of HEATING6, with a few additional parameters. The user is referred to Reference 3 for detailed information on setting up a basic HEATING6 heat conduction problem. For convenience we include in Section 3.2 an abbreviated version of the basic HEATING6 input description taken from that report. In Section 3.1, the changes to the basic input which were added to provide for nuclear heat source calculations are summarized.

In addition to the input provided on cards by the user, DOS-HEATING6 needs values for the DOT calculational parameters obtained from the VARFLM file input to the code whenever a nuclear heating calculation is performed. The following are some of these parameters:

IGM = number of energy groups in DOT calculation
JM = number of J intervals (e.g., Z or Θ)
ISM = number of variable I-mesh sets
IMSISM = total number of I intervals, all sets.

3.1 Additional HEATING6 Input Required For Nuclear Heating Calculations

The option to perform a nuclear heating calculation with DOS-HEATING6 is indicated by setting a new parameter called "IDOT" equal to an integer greater than zero. The IDOT parameter is entered as the last variable in the NAMELIST /OPTION/ which is part of the standard HEATING6 namelist input. The value for IDOT corresponds to the logical unit number assigned to the DOT VARFLM file, which is input to DOS-HEATING6 to provide fluxes for the nuclear heat source calculation.

The only other special input required for nuclear heating calculations are the kerma factors. Macroscopic (i.e., "pre-mixed") kermas are entered by group, for each material in the problem. This is done in the "Material Data Block" of the standard HEATING6 input. Previously, there were two types of cards in this block for each material in the problem: "Card M" to assign thermal properties for the material; and "Card PC" (optional) to assign phase change information for those materials which are allowed to melt or boil. In the DOS version, a third type of card (card K) is also required if the parameter IDOT (in the NAMELIST /OPTION/) is positive. The "IGM" group-wise values for the kerma factors of the material are entered on the K cards, starting with group 1 (highest energy) and ending with group "IGM" (lowest energy). The value for IGM is read by HEATING6 from the DOT flux file, and of course the group structure of the kerma factors must be consistent with the DOT fluxes.

3.2 Input Variable Description

This section was taken directly from Section 10.3 of Reference 3 and is designed to guide the user through the steps necessary to solve a heat transfer problem with HEATING6. First, a set of instructions is presented to aid the user in representing the geometrical configurations of the problem with a lattice of points. Then, the functions used by the code to define the material parameters are given, followed by a discussion of user-supplied subroutines.

Regions

The configuration of the problem is approximated by dividing it into regions, depending on the shape, material structure, indentations, cutouts, and other deviations from the general geometry. In some cases, zoning into regions must be done in order to describe a specific boundary condition or a material whose thermal conductivity, density, or specific heat is a function of position. There are three basic rules governing region division:

(1) Boundary lines or planes must be parallel to the coordinate axes (two points, four lines, or six planes are required to enclose a region in one-, two- or three-dimensional geometry. respectively).

(2) A region may contain at most one material (however, many regions may contain the same material). A gap region does not contain a material.

(3) When a boundary condition is defined along the boundary of a region, it must apply along the full length of the boundary line for two-dimensional problems and over all of the boundary plane for three-dimensional problems.

Consider, for example, a case consisting of a simple rectangle in XY geometry, half of which contains one material, and the other half a second material, as depicted in Fig. 3.1.

This elementary case would require two regions (as indicated), one for each material. If the upper right corner of the rectangle is omitted as in Fig. 3.2, three regions are required as shown.

This division of the right half of the rectangle into two regions accounts for the indented or cutout upper right corner. Note that regions 2 and 3 of Fig. 3.2 contain the same material.

Now consider the case of Fig 3.2, introducing boundary conditions as in Fig 3.3. The left boundary of the left-most rectangle now contains two different boundary types. Thus, in accordance with the third basic rule, region zoning is performed to account for the different boundary conditions, and an additional region is required.

To specify heat transfer between parallel surfaces, one defines a region whose boundaries include the two parallel surfaces. Then, the boundary condition describing the heat transfer process is applied along both of the surfaces of this region. Although the regions adjoining the parallel surfaces involving the surface-to-surface heat transfer may be composed of more than one material, they must be defined and must contain a material. The region itself may or may not contain a material. In Fig. 3.4, surface-to-surface heat transfer cannot be defined between the left and right boundaries of Region 3 since part of the area adjoining the right boundary is undefined. In Fig. 3.5 surface-to-surface boundary conditions can be applied along the left and right sides of Region 3.

If a surface-to-surface (type 3) boundary condition has been defined along a surface of a region and a surface-to-boundary (type 1) boundary condition is desired along the same surface, then the type 1 boundary condition must be applied along the surface of the adjoining region. In Fig. 3.5, surface-to-surface boundary conditions can be applied along the left and right sides of Region 3 while a surface-to-boundary boundary condition can be applied along the left side of Region 4. This can be done only if Region 3 is a gap region.

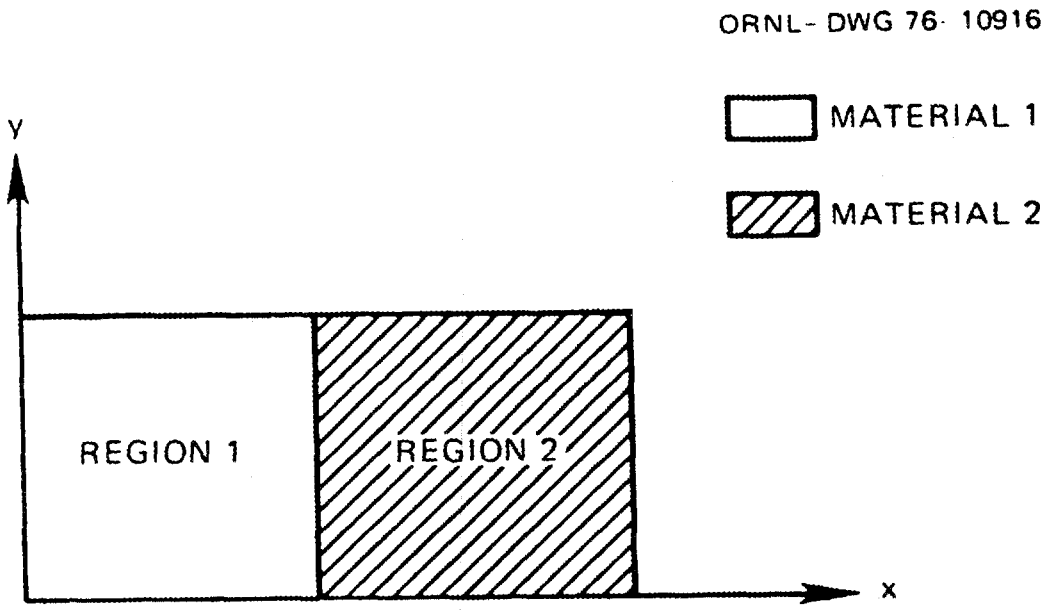

Fig. 3.1. HEATING6 Region Description for Two-Dimensional, Rectangular Model Composed of Two Materials

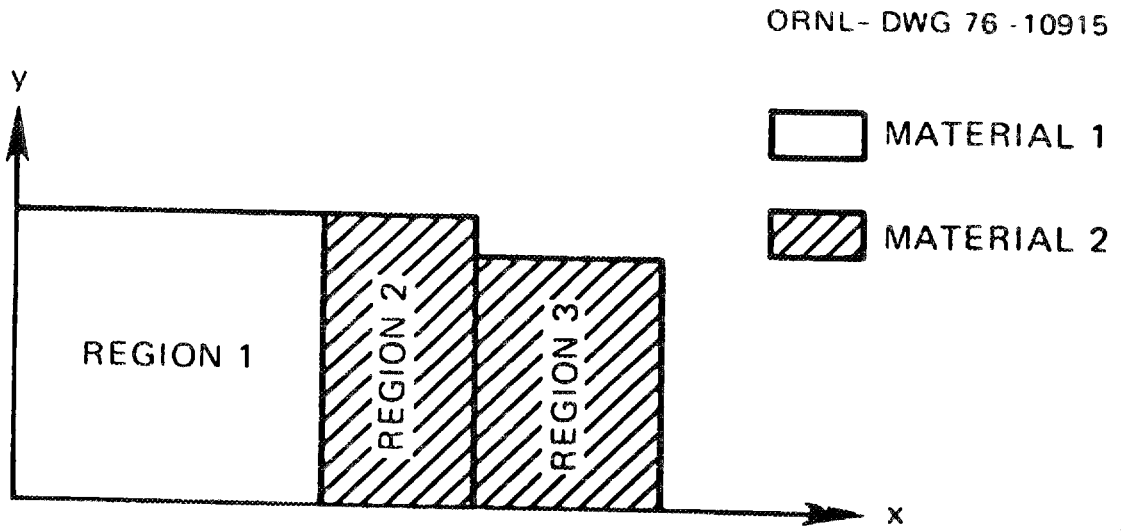

Fig 3.2. HEATING6 Region Description for Two-Dimensional, Rectangular Model with Indentation

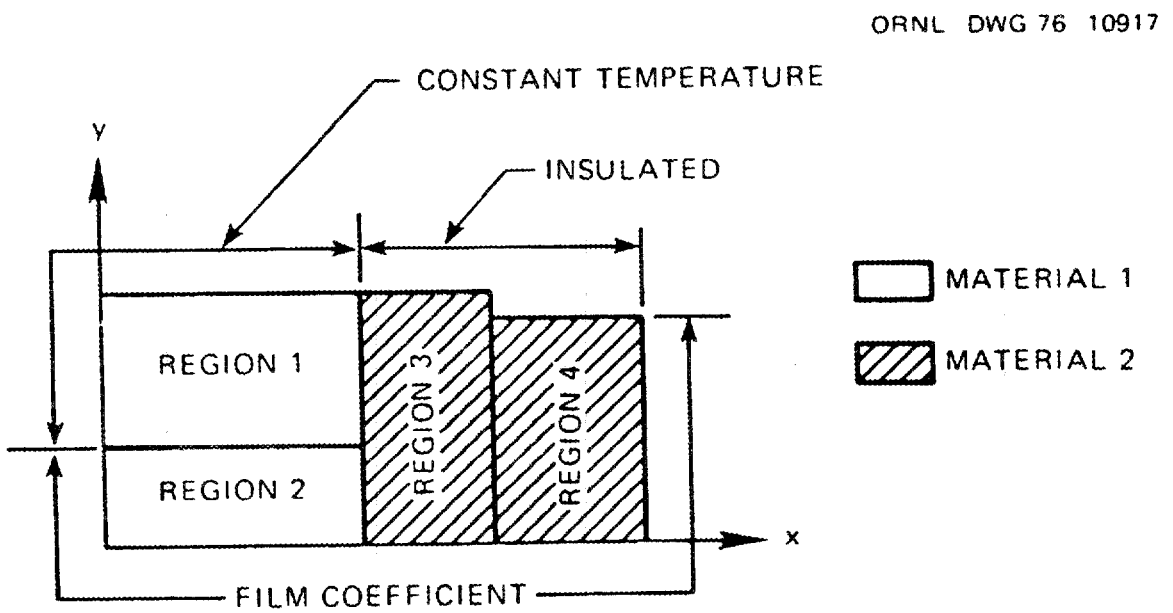

Fig. 3.3. HEATING6 Region Description for Two-Dimensional, Rectangular Model with Various Boundary Conditions

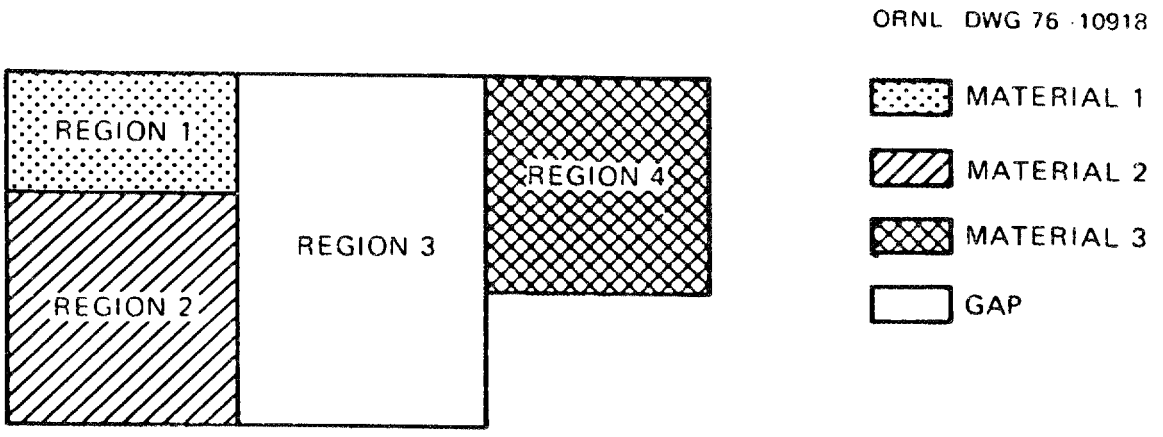

Fig. 3.4. Region Description for Two-Dimensional, Rectangular Model Involving Surface-to-Surface Boundary Conditions, Incompatible with HEATING6

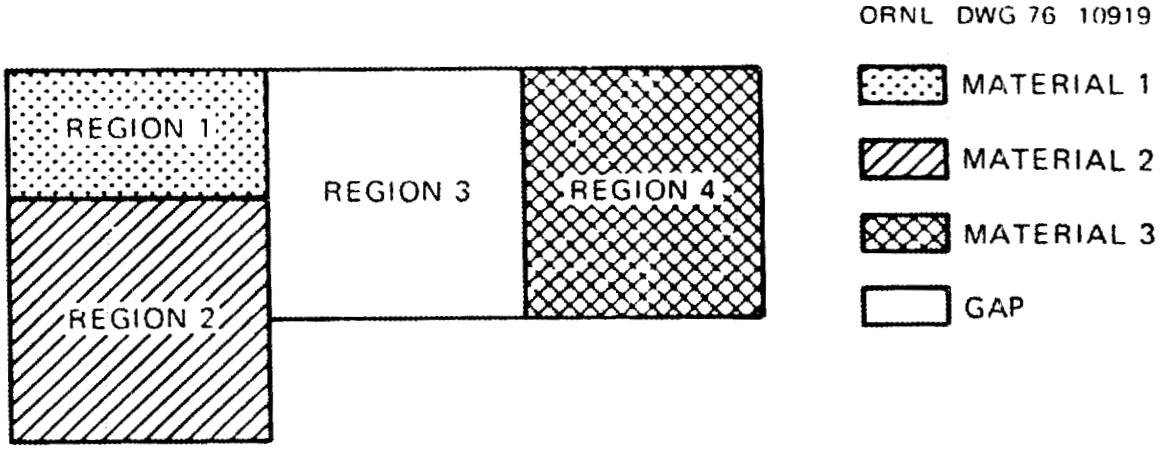

Fig. 3.5. HEATING6 Region Description for Two-Dimensional, Rectangular Model Involving Surface-to-Surface Boundary Conditions

Lattice Arrangement

The second requirement for describing the overall configuration is to construct a set of lattice lines perpendicular to each axis and extending the entire length of the remaining coordinates. The lattice lines are really points, lines, or planes for a one-, two-, or three-dimensional problem, respectively. However, the phrase, "lattice line," will be used for illustrative purposes. The lattice is defined in the following manner. The lattice lines are divided into two classes: gross lattice lines and fine lattice lines. A gross lattice line must be specified at both region boundaries along each axis. Fine lattice lines, equally spaced, may appear between two consecutive gross lines to create a finer mesh. If unequal mesh spacing is desired within a particular region, then gross lattice lines may appear with that region. A nodal point is defined by each lattice point in one-dimensional problems, by each intersection of two lattice lines appearing in a material region or on its boundary in two-dimensional problems, and by every intersection of three lattice planes appearing in a material region or on its boundary in three-dimensional problems. The points are numbered consecutively by the program at the intersection of each X- (or R-), Y- (or Θ-), and Z-plane starting with the planes nearest the origin and changing the X- (or R-) plane most rapidly and the Z-plane least. Temperatures are calculated at each such nodal point.

In a nuclear heating calculation, the HEATING6 node arrangement is made independently of the mesh used in the DOT transport calculation. Thus the selection of the DOT mesh can be based on particle transport considerations, whereas the DOS-HEATING6 mesh can be selected on temperature gradient considerations.

Analytical and Tabular Functions

The analytical and tabular functions are built-in functions which may be used to aid in the description of some of the input variables. An analytical function is defined by

$$F(v)=A_1+A_2v+A_3v^2+A_4\cos(A_5v)+A_6\exp(A_7v)+A_8\sin(A_9v)+A_{10}\ln(A_{11}v) \quad (3.1)$$

A tabular function is defined by a set of ordered pairs, $(v_1,G(v_1))$, $(v_2,G(v_2)),\ldots,(v_n, G(v_n))$, where the first element of a pair is the independent variable and the second is the corresponding value of the function. In order to evaluate the tabular function at some point, the program uses linear interpolation in the interval containing the point. The set of ordered pairs must be chosen so that the independent variables are arranged in ascending order or

$$v_1 < v_2 < v_3 <\ldots< v_{n-1} < v_n. \quad (3.2)$$

If the function must be evaluated at some point outside of the defined domain of the function, then

$$G(v) = \begin{matrix} G(v_1), & v < v_1 \\ G(v_n), & v > v_n \end{matrix} \quad (3.3)$$

Input Variables

The input variables included in Table 3.1 must be defined by a function having the following form:

$$P(x,y,z,t,T) = P_o\cdot f(x,y,z,t,T) \quad (3.4)$$

where P_o is a constant factor and $f(x,y,z,t,T)$ may be a product of analytical and tabular functions, such as

$$f(x,y,z,t,T) = F_i(x)\cdot F_j(y)\cdot F_k(z)\cdot F_\ell(t)\cdot F_m(T). \quad (3.5)$$

In observing the definitions of the input parameters (see Table 3.1) which may be defined by Eq.(3.4), it is noted that only the volumetric external heat generation rate is a function of all the independent

Table 3.1. Dependence of Input Parameters

Parameter	Function of x	y	z	t	T	Related User-Supplied Subroutine
k				(x)	x	CONDTN
ρ				(x)	x	DNSITY
C_p				(x)	x	CPHEAT
T_o	x	x	x	(x)		INITTP
Q_E	x	x	x	x	x	HEATGN
T_b	x	x	x	x		BNDTMP
h_c	(x)	(x)	(x)	x	x	CONVTN
h_r	(x)	(x)	(x)	x	x	RADITN
h_n	(x)	(x)	(x)	x	x	NATCON
h_e	(x)	(x)	(x)	x	x	NCONEX
h_f	(x)	(x)	(x)	x	x	BNFLUX

NOTE: The x enclosed in parentheses, (x), indicates that although the parameter cannot be an explicit function of the indicated variable using normal input data, this variable is initialized in the respective user-supplied subroutine. Thus, the parameter can be a function of the indicated variable if it is so defined in its respective user-supplied subroutine.

variables. Thus, if any variable is omitted from the definition of the parameter, then the corresponding factor is set equal to unity in Eq. (3.5). The constant factor, P_0, is part of the input data, and its value appears on the data card which is used to define the parameter. If one of the input parameters is to be a function of position, time or temperature, then the appropriate index or indices, i,j,k,l or m, from Eq. (3.5) are entered on a data card, too. If an index is positive, then it defines the number of the analytical function for the respective variable. If it is negative, then the absolute value of the index defines the number of the tabular function for the respective variable. If any of the defined factors for a parameter are omitted from the input data, then that particular factor is set equal to unity in Eq. (3.5). If none of the factors are defined in the input, then that particular parameter is treated as a constant. If the value of P_0 is zero or is left blank on the data card and if the data indicates that the parameter is to be function of position, time or temperature, then P_0 is set equal to unity in Eq. (3.4) If the value of P_0 is zero or is left blank and if the data indicates that the parameter is not a function of position, time, or temperature, then P_0 is set equal to zero in Eq. (3.4).

NOTE... The nuclear heating source is not specified by the user with an analytical or tabulated function. It is computed internally by the code. Only the external heat generation is input in this manner.

If a particular variable cannot be defined by a product of analytical and tabular functions as indicated in Eq. (3.5) then the user may supply his own subroutine to evaluate Eq. (3.4).

User-Supplied Subroutines

Subroutines may be supplied by the user to evaluate any of the parameters listed in Table 3.1. Thus, if an input parameter cannot be defined by one of the built-in functions as described previously, it is quite simple for the user to add his own computational technique for evaluating the parameter. The user-supplied subroutine is referenced by specifying one of the factors of the parameter as an analytical function (i.e., leave the second entry on the A1 card blank and omit the related A2 card). Since this analytical function is only a flag to tell the code to call the appropriate user-supplied subroutine, the same analytical function can be specified for more than one parameter. The computational technique is then programmed in the subroutine associated with the parameter of interest. For the heat generation rate parameter, the time-dependent factor is evaluated independently of the other factors, and thus, the time-dependent factor can be specified as user-supplied independent of the position- and time-dependent factors. More details on how to set up a user-supplied routine are given in the HEATING6 report.[3]

3.3 User Input Procedures

A discussion of the input cards is presented in this section followed by a brief outline of the input data. A much more thorough description of the HEATING6 input specifications is given in Reference 3. Much of this section is condensed from that reference. In preparing the input data, any consistent set of units may be used in the HEATING6 program except for problems involving radiation. Then, the default for temperature units is degrees Fahrenheit. If the temperature units are either degrees Celsius or absolute degrees, the temperature units flag must be properly set. The units associated with the algorithms which appear in user-supplied subroutines must be consistent with those of the input data. For nuclear heating calculations, the units on the kerma factors must be consistent both with the DOT flux units (usually in $cm^{-2}s^{-1}$), as well as the energy units of the other input parameters.

The input data for HEATING6 is read using the SCALE free-form reading routines (see Reference 4) which allow data to be entered in an unformatted manner by separating each data item by one or more blanks or by a comma. With a few exceptions noted below, the data items may be entered anywhere in columns 1 through 72. If the data that is to appear on a card will not fit on one card (i.e., the printout times), an "@" must appear in column 1 of each continuation card. Otherwise, the code will read the remaining data for that card image as either zero or blank. There is no limit to the number of continuation cards. However, a continuation card may not immediately follow a title card, an end-of-data card, a comment card, or a keyword indicator car. Columns 73 through 80 of each card are reserved for identification to aid the user

in the preparation and handling of data. The following discussion concerning the free-form input data was taken from Reference 4. Decimal data may be entered as in FORTRAN input, e.g., 1.733-4, 1.733E-4, 1.733D-4, or 0.0001733 is the same as 1.733×10^{-4}. Note that embedded blanks are not allowed within a given number representation. SCALE free-form reading routines have provisions for multiple entrees of the same data value. This is done by entering the number of repeats, followed by either R, *, or $, followed by the data value to be repeated. For example, 5R2 or 5*2 enters five successive 2's in the input data. There must not be any blanks between the number of repeats and the repeat flag (R, *, or $), but each multiple entry must be separated from the rest of the data by one or more blanks or by a comma. Since blanks are ignored, an embedded zero must be specified in the input data either as 0 followed by one or more blanks, as 0 followed by a comma, or as one or more blanks followed by a comma. However, trailing blanks may be omitted. Multiple zeros may be specified as NZ where N is the number of zeros to be repeated. Again, there must not be any blanks between the N and the Z but the NZ must be separated from the rest of the data by one or more blanks or by a comma. All literal data fields, such as the material names, must be delimited by a blank. They must not be delimited by a comma.

The input data for an execution of HEATING6 consists of data defining the size of the variably dimensioned arrays and the options that will be in effect during the computer run and is read using the NAMELIST /OPTION/. This data is followed by data decks for each case to be solved. A data deck for a case consists of a title card, two parameter cards, and the data blocks necessary to define the problem

being modeled. The user may wish to add comment cards to the input data to assist in documenting a model. Any number of comment cards may appear anywhere in the input data deck following the title card except a comment card may not precede a continuation card. The comment cards are identified by an asterisk (*) in column 1. These comments will be written on the standard output unit as they are encountered.

Seventeen different data blocks may be used in describing the model to the computer code. Except for the transient parameters data block which must be the final block defined for a case, the data blocks may appear in any order and may occur more than once. A case must contain a REGI and a MATE data block. A data block must consist of a block indicator card containing the keyword in the first four columns followed by the data cards for that block. There cannot be any embedded blanks in the first four characters of the keyword. The keyword for each data block is contained in Table 3.2.

The data reference numbers, i.e., the region number, material number, etc., in the REGI, MATE, INIT, HEAT, BOUN, ANAL, and TABU blocks may appear in any order within the block and may have any integer value accepted by the machine. If a data reference number appears more than once within a data block, the last data read with that reference number applies. If a data reference number is negative, it deletes the related data that may have been previously defined for the parameter identified by the absolute value of the data reference number.

The final data card in a data deck for a case is an end-of-data card and must contain a percent (%) in column 1 and a blank in column 2. This card signifies the end of data for a problem and usually allows the code to locate the start of the next problem when a data error occurs in

Table 3.2. Data Block Keywords

REGIONS
MATERIALS
INITIAL TEMPERATURES
HEAT GENERATIONS
BOUNDARY CONDITIONS
XGRID
YGRID
ZGRID
ANALYTICAL FUNCTIONS
TABULAR FUNCTIONS
PRINTOUT TIMES
NODES MONITORED
SPECIFIED PLANE OUTPUTS
PLANES PRINTED
TEMPERATURES OF NODES
STEADY STATE PARAMETERS
TRANSIENT PARAMETERS *

*"Transient Parameters" block must be last block of data if it is used.

a problem or when a case terminates before all of the input data was read. As HEATING6 reads the input data, it sets a flag when an error is encountered and continues to read additional data unless the error was fatal. When the end of data indicator (%) or the TRAN keyword identifying the transient parameters data block is encountered, HEATING6 terminates reading and commences processing the input data. After processing is completed, the code performs the specified calculations unless an error was encountered, in which case it looks for the beginning of the input data for the next case.

In the sections that follow, the characters (A), (I), or (R) may appear after the heading for some of the entries to indicate that the entry is alphanumeric, integer or real, respectively. Also, suggested data card labels follow each data block section heading. These labels may be entered in columns 73-80 of the related data cards to aid in identifying the data.

When a data reference number is negative, the remaining data on that card may be omitted and any additional data cards related to that parameter must be omitted. As an example, if the region number on an R1 card is negative, then the remaining data on the R1 card may be left blank and the related R2 card must be omitted.

3.4 Card Input Specification

NAMELIST /OPTION/

In general, it is advantageous to tailor DOS-HEATING6 to a specific problem by overriding certain default values for array sizes with values applying to the problem in question. This can be accomplished by supplying a new BLOCK DATA subprogram as discussed in Sect. F10.3.7 of

Reference 3. However, an alternate and easier method is to use the NAMELIST /OPTION/ input feature described below. Each of the variables in the above-mentioned labeled common blocks whose default value can be modified appears in NAMELIST /OPTION/. The NAMELIST /OPTION/ must also be entered in order to specify a nuclear heating calculation. These variables and their default values appear in Table 3.3.

The first record read by HEATING6 contains data for NAMELIST /OPTION/. This allows the user to change the default value of any or all variables in NAMELIST /OPTION/ by merely including the symbolic name or (variable name) and the desired value for each value to be changed. These parameters then apply to HEATING6 for the entire run. The exact format for the data group for NAMELIST /OPTION/ follows.

The first column of the first data record (card) must contain a blank. The second column must be an "&" immediately followed by the name OPTION. The name OPTION must be followed by a blank in column 9. The resulting character string must not contain any embedded blanks. This character string is followed by data items separated by commas. A comma after the last data item is optional. The end of the NAMELIST /OPTION/ data group must be signaled by &END with no embedded blanks. Each data item must consist of the symbolic name of the variable, followed by an equal sign, followed by a constant (desired value). All variables in NAMELIST /OPTION/ are either integer, logical, or literal. For integer constants, trailing blanks are treated as zeros. Logical constants may be in the form "T" for "TRUE" and "F" or "FALSE". Embedded blanks are not permitted in either the symbolic name or the constants. If more than one data record (card) is necessary to

Table 3.3. List of Variables Whose Default Values May Be Modified Through NAMELIST/OPTION/

MAXANA	5	MAXIMUM NUMBER OF ANALYTICAL FUNCTIONS
MAXBDC	5	MAXIMUM NUMBER OF BOUNDARY CONDITION FUNCTIONS
MAXCP	*	MAXIMUM NUMBER OF MATERIALS WITH PHASE CHANGE (SET TO 5 BY CODE)
MAXFGL	*	MAXIMUM NUMBER OF FINE GRID LINES ALONG ANY AXIS (CALCULATED BY CODE)
MAXGGL	10	MAXIMUM NUMBER OF GROSS GRID LINES ALONG ANY AXIS (MAY BE DECREASED BY CODE IF MAXFGL IS LESS)
MAXHGN	5	MAXIMUM NUMBER OF HEAT GENERATION FUNCTIONS
MAXINT	5	MAXIMUM NUMBER OF INITIAL TEMPERATURE FUNCTIONS
MAXMAT	5	MAXIMUM NUMBER OF MATERIALS
MAXNSN	5	MAXIMUM NUMBER OF NODES FOR SPECIAL MONITORING OF TEMPERATURES
MAXPAR	*	MAXIMUM NUMBER OF PARAMETERS IN AN ANALYTICAL FUNCTION (SET TO 11 BY CODE)
MAXPBT	1	MAXIMUM NUMBER OF POSITION DEPENDENT BOUNDARY TEMPERATURE NODES
MAXPRS	10	MAXIMUM NUMBER OF PAIRS IN EACH TABULAR FUNCTION
MAXPRT	10	MAXIMUM NUMBER OF PRINTOUT TIMES
MAXPTS	50	MAXIMUM NUMBER OF LATTICE POINTS (NODES)
MAXREG	5	MAXIMUM NUMBER OF REGIONS
MAXRFG	50	MAXIMUM NUMBER OF RADIAL (OR X) FINE GRID LINES
MAXSPC	10	MAXIMUM NUMBER OF PRINTOUT TIMES FOR SELECTED PLANES
MAXSPL	20	MAXIMUM NUMBER OF PLANES FOR SELECTED OUTPUT
MAXSUR	50	MAXIMUM NUMBER OF SURFACE-TO-SURFACE CONNECTORS
MAXTBL	5	MAXIMUM NUMBER OF TABULAR FUNCTIONS
MAXTFG	50	MAXIMUM NUMBER OF THETA (OR Y) FINE GRID LINES
MAXZFG	50	MAXIMUM NUMBER OF Z FINE GRID LINES
IHCHAR	-	HORIZONTAL DIVIDER SYMBOL FOR OUTPUT MAP
IVCHAR	I	VERTICAL DIVIDER SYMBOL FOR OUTPUT MAP
NDIMEN	3	MAXIMUM NUMBER OF DIMENSIONS (1,2, or 3)
CEP	T	CLASSICAL EXPLICIT PROCEDURE, TRANSIENT (T OR F)
DIRECT	T	DIRECT SOLUTION TECHNIQUE, STEADY STATE (T OR F)
FIN	F	FINNED SURFACE ANALYSIS (T OR F)
HGEN	T	EXTERNAL HEAT GENERATION, IN ADDITION TO NUCLEAR HEATING (T OR F)
IMPFLG	T	IMPLICIT PROCEDURE, TRANSIENT (T OR F)
LBOUND	F	POSITION DEPENDENT BOUNDARY TEMPERATURES (T OR F)
LEVI	T	LEVY'S EXPLICIT PROCEDURE, TRANSIENT (T OR F)
MELTFG	F	MATERIAL PHASE CHANGE, TRANSIENT (T OR F)
IERROR	0	LOGICAL UNIT NUMBER ON WHICH SELECTED ERROR MESSAGES MAY BE WRITTEN (OPTIONAL)
IMATLB	0	LOGICAL UNIT NUMBER FROM WHICH DATA FROM THE MATERIAL PROPERTIES LIBRARY MAY BE READ (OPTIONAL)
IN	4	LOGICAL UNIT NUMBER OF SCRATCH DATA SET ON WHICH STANDARD INPUT DATA IS WRITTEN IN SUBROUTINE ECHO AND FROM WHICH STANDARD INPUT DATA IS READ ELSEWHERE IN CODE

Table 3.3 (CONTD.)

IO	6	LOGICAL UNIT NUMBER ON WHICH STANDARD OUTPUT IS WRITTEN
IPLOT	0	LOGICAL UNIT NUMBER OF WHICH PLOT DATA SET MAY BE WRITTEN (OPTIONAL)
IPLOTO	0	LOGICAL UNIT NUMBER FROM WHICH OLD PLOT DATA SET MAY BE READ FOR RESTART CASES INVOLVING PLOT OPTION (OPTIONAL)
IRECLG	80	NUMBER OF SINGLE WORDS IN EACH RECORD OF DATA OUTPUT IN UNFORMATTED FORM ON UNIT IBIN (MAXIMUM - 80)
ITPIN	0	LOGICAL UNIT NUMBER FROM WHICH THE INITIAL TEMPERATURE DISTRIBUTION MAY BE READ (OPTIONAL)
ITPOUT	0	LOGICAL UNIT NUMBER ON WHICH THE FINAL TEMPERATURE DISTRIBUTION MAY BE WRITTEN (OPTIONAL)
IW	9	CORRESPONDS TO W IN FORMAT CODE IPNDW.S OR OPNFW.S FOR TEMPERATURES IN TEMPERATURE OUTPUT MAP
IS	2	CORRESPONDS TO S IN FORMAT CODE 1PNDW.S. OR OPNFW.S FOR TEMPERATURES IN TEMPERATURE OUTPUT MAP
IR	2	CORRESPONDS TO R IN FORMAT CODE 1PNDW.R OR OPENEW.R FOR HORIZONTAL FINE GRID LINES IN TEMPERATURE OUTPUT MAP
IL	9	CORRESPONDS TO L IN FORMAT CODE 1PDL.M OR OPFL.M FOR VERTICAL FINE GRID LINES IN TEMPERATURE OUTPUT MAP
IM	2	CORRESPONDS TO M IN FORMAT CODE 1PDL.M OR OPEL.M FOR VERTICAL FINE GRID LINES IN TEMPERATURE OUTPUT MAP
LTPEX	F	T OR F FOR FORMAT CODE OF 1PNDW.S OR OPNEW.S FOR TEMPERATURES IN TEMPERATURE OUTPUT MAP
LFGHEX	F	T OR F FOR FORMAT CODE OF 1PNDW.R OR OPENEW.R FOR HORIZONTAL FINE GRID LINES IN TEMPERATURE OUTPUT MAP
LFGVEX	F	T OR F FOR FORMAT CODE OF 1PDL.M OR OPEL.M FOR VERTICAL FINE GRID LINES IN TEMPERATURE OUTPUT MAP
DEBUG	F	FLAG CONTROLLING OUTPUT OF VARIABLY DIMENSIONED ARRAY POINTERS FOR DEBUGGING (T OR F)
MWIDTH	7	MAXIMUM BANDWIDTH IN COEFFICIENT MATRIX FOR DIRECT SOLUTION TECHNIQUE, STEADY STATE
*IDOT		IF > 0, NUCLEAR HEATING CALCULATION: SET EQUAL TO LOGICAL UNIT NUMBER FOR DOT VARFLM FLUX FILE USED TO GENERATE NUCLEAR HEATING SOURCE

(*) NEW PARAMETER ADDED TO HEATING6 FOR NUCLEAR HEATING CALCULATIONS.

contain the data group, each new data record (card) must begin with a blank in column 1. Table 3.3 contains each symbolic name (or variable) along with its definition and its current default value.

Card 1 - Title of Problem

This card, which can contain alphanumeric characters in the first 72 columns, contains a descriptive title for the problem and must be the first card in the data deck for each case. The card itself cannot be omitted although it may be left blank. This title serves to identify the output associated with a case since it appears at the top of a number of the tables generated by the code. It is also included with a number of messages output by the code.

Table 3.4 at the end of this section gives the input cards required for each of the data blocks listed in Table 3.2. This represents an abbreviated outline of the various input cards, without giving much detail about the data itself, which can be found in Reference 3.

Table 3.4 - An Abbreviated Outline of the Various Input Cards for DOS-HEATING6

NOTE : Equation and Section numbers of the form "Fxx.x.x" or "Fxx.x.xx" or "Fxx.x.x.x" mentioned in Table 3.4 pertain to Reference 3.

Table Summary and Format of Input

Entry 1	Entry 2	Entry 3	Entry 4	Entry 5	Entry 6	Entry 7	Entry 8	Entry 9	Card
JOBDES - Job Description - Up to 72 Alphanumeric Characters									Card 1 (F10.5.3)
MXCPU(I) Maximum CPU time for IBM-3033 or IBM-360/195 in seconds.	NGEOM(I) Geometry type. 1-RΘZ 6-XYZ 2-RΘ 7-XY 3-RZ 8-XZ 4-R 9-X 5-Z 10-R(spheres)	NTYPE(I) Problem type. 1 steady state -1 transient (See Sec.F-10.5.4.3 for other types)	TIM(R) Initial time. (See Sec.F10.5-.4.4 for more information)	FTIM(R) Final time.	DELTAT(R) Time increment for transient problem involving explicit technique.	KTMFCT(I) Factor by which stable time increment is increased if Levys explicit method is used.	IDEGRE(I) Temperature units. 1 implies °C and radiation is involved. 2 implies absolute degrees. 0 otherwise.	JOBCON(I) Case type. 0 for new case. 1 or greater for continuation of previous case.(See Sec.-F10.5.4.9)	Card 2 (F10.5.4)
JPLOT(I) Plot dataset flag.Nonzero implies data will be written on unit IPLOT.Negative implies data will be added to data from previous case read from unit IPLOTO.	NOUTPT(I) Number of time steps between outputs for plots on unit number IPLOT. If zero,output is at normal printouts.	NTS(I) Number of iterations or time steps between output for special monitoring of temperatures.	JTPIN(I) Flag for reading initial temperature distribution on logical unit ITPIN.Positive,formatted.Negative,unformatted.	JTPOUT(I) Flag for writing final temperature distribution on logical unit ITPOUT. Positive,formatted.Negative, unformatted.	IOPLNE(I) Three-dimensional output map flag.0 for XY planes, 1 for XZ planes, 2 for YZ planes.	NDTA(I) Number of time steps between standard output of temperature maps.	JERROR(I) Flag for output of selected data indicating problem status on unit IERROR.	IMONTR(I) Flag for output of selected information during calculations.	Card 3 (F10.5.5)
REGIONS									
NOREG(I) Region Number.	MATL(I) Region material number.(Card M).Enter zero for gap region.	RRIN(R) Smaller X or R region dimension.	RROT(R) Larger X or R region dimension.	THLT(R) Smaller Y or Θ region dimension.	THRT(R) Larger Y or Θ region dimension.	ZZBK(R) Smaller Z region dimension.	ZZFR(R) Larger Z region dimension.		Card R1 (F10.5.6) Maximum MAXREG
ITEM(I) Region initial temperature function number.(Card I)	NGEN(I) Region heat generation function number. (Card G)	NBDIN(I) Boundary condition on smaller X or R. (Card B)	NBDOT(I) Boundary condition on larger X or R. (Card B)	NBDLT(I) Boundary condition on smaller Y or Θ . (Card B)	NBDRT(I) Boundary condition on larger Y or Θ . (Card B)	NBDBK(I) Boundary condition on smaller Z. (Card B)	NBDFR(I) Boundary condition on larger Z. (Card B)		Card R2 (F10.5.6)

Table 3.4 (Contd.)

MATERIALS

MAT(I) Material number.	MATNAM(A) Material name.	CONDUC(R) Conductivity if constant.	DENSTY(R) Density if constant. Enter zero for steady state only.	SPHEAT(R) Specific heat if constant. Enter zero for steady state only.	NCONTP(I) Conductivity temperature-dependent function number.	NDENTP(I) Density temperature-dependent function number. Enter zero for steady state only.	NSPHTP(I) Specific heat temperature-dependent function number. Enter zero for steady state only.	MCP(I) Phase change flag. Zero implies no phase changes.	Card M (F10.5.7) Maximum MAXMAT
					Note: For the 6th through 8th entries, positive integer implies analytical function and negative integer implies tabular function.				
SLTM(R) Phase-change or transition temperature.	SLHM(R) Latent heat.	Note: This card is only present for materials with phase change capabilities. There can be only MAXCP such materials.							Card PC (F10.5.7)
XKERM(R) Group-wise Kerma Factors of the material starting with energy group "1" (highest energy) and ending with energy group "IGM"(lowest energy)									Card K
OR									
MAT(I) Material number.	MATNAM(A) Material name. Library material number preceeded by * .	MUNCH(I) Data unit conversion flag.	XD(R) Unit conversion factor for density.	XC(R) Unit conversion factor for specific heat.	XK(R) Unit conversion factor for conductivity.	XT(R) Unit conversion factor (mult.) for temperature.	XTP(R) Unit conversion factor (add.) for temperature.	MCP(I) Phase change flag. Zero implies no phase changes.	Card M (F10.5.7)
XKERM(R) Group-wise Kerma Factors of the material starting with energy group "1"(highest energy) and ending with energy group "IGM"(lowest energy)									Card K

Table 3.4 (Contd.)

INITIAL TEMPERATURES								
INTM(I) Initial temperature function number.	TEMPIN(R) Initial temperature, if constant.	ITMR(I) X- or R-dependent function number.	ITMTH(I) Y- or Θ-dependent function number.	ITMZ(I) Z-dependent function number.	NOTE: For the 3rd, 4th, and 5th entries, positive integer implies analytical function, negative integer implies tabular function.			Card I (F10.5.8) Maximum MAXINT
HEAT GENERATIONS								
NGN(I) Heat generation function number.	GENO(R) Volumetric heat generation rate, if constant.	NGNTM(I) Time-dependent function number.	NGNTP(I) Temperature-dependent function number.	NGNR(I) X- or R-dependent function number.	NGNTH(I) Y- or Θ-dependent function number.	NGNZ(I) Z-dependent function number.	NOTE: For the 3rd through 7th entries, positive integer implies analytical function, negative integer implies tabular function.	Card G (F10.5.9) Maximum MAXHGN
BOUNDARY CONDITIONS								
NBDTP(I) Boundary number.	NBYTYP(I) Boundary type. 1-surface-to-boundary. 2-isothermal. 3-surface-to-surface.	BYTEMP(R) Boundary temperature, T_o. Enter zero for NBTYP=3	NBYTFN(I) Time-dependent function number for boundary condition.	NBYXFN(I) X- or R-dependent function number for boundary temperature.	NBYYFN(I) Y- or Θ-dependent function number for boundary temperature.	NBYZFN(I) Z-dependent function number for boundary temperature.		Card B1 (F10.5.10) Maximum MAXBDC
			NOTE : For the 4th through 7th entries, postive integer implies analytical function, negative integer implies tabular function. All should be zero for NBYTYP=3.					
BHCONV(R) Forced convective heat transfer coefficient. h_c	BHRAD(R) Radiative coefficient. $h_r = F * \sigma$ σ = Stefan-Boltzman constant. F = Radiation-shape factor.	BHNAT(R) Natural convective coefficient. h_n	BHEXP(R) Natural convective exponent. h_e	BFLUX(R) Prescribed heat flux (positive if going to surface.) h_f	IBHFLG(I) Parameter flag. 0-no additional cards. 1-B3 card only. 2-B4 card only. 3-B3 and B4 cards.	IFINTP(I) Fin effectiveness flag. 0-no B5 card. 1-10 fin effectiveness (see Table F10.5.3). 11-user supplied.		Card B2 (F10.5.10)
NBHCTM(I) Forced convective heat transfer coefficient time-dependent function.	NBHRTM(I) Radiative coefficient time-dependent function.	NBHNTM(I) Natural convective coefficient time-dependent function.	NBHETM(I) Natural convective exponent time-dependent function.	NBHFTM(I) Prescribed heat flux time-dependent function.	Postive integer implies analytical function. Negative integer implies tabular function.			Card B3 (F10.5.10)

Table 3.4 (Contd.)

NBHCTP(I) Forced convective heat transfer coefficient temperature-dependent function.	NBHRTP(I) Radiative coefficient temperature-dependent function.	NBHNTP(I) Natural convective coefficient temperature-dependent function.	NBHETP(I) Natural convective exponent temperature-dependent function.	NBHFTP(I) Prescribed heat flux temperature dependent function.	Positive integer implies analytical function, negative integer implies tabular function.		Card B4 (F10.5.10)
FINLEN(R) Fin height from base surface.	DELBAS(R) Half width of fin at base.	DELTIP(R) Half width of fin at tip.	S1(R) Fin spacing.	S2(R) Spine spacing.	HFAC(R) Fin heat capacity multiplier. Negative implies no adjustment to node. (Default, 1.0)		Card B5 (F10.5.10)
XGRID							
RG(R) Smallest X or R gross lattice line dimension.	RG(R) Next X or R gross lattice line dimension.	RG(R) Next X or R gross lattice line dimension.	NOTE: Maximum of MAXGGL.				Card L1 (F10.5.11)
NDRG(I) Number of divisions between corresponding X or R gross line and the following line.	NDRG(I)	NDRG(I)	NOTE: Must have one less entry than in L1 cards. Maximum of MAXRFG.				Card N1 (F10.5.11)
YGRID							
THG(R) Y or θ	NOTE: Same as L1 cards except for Y or θ direction. Maximum of MAXGGL.						Card L2 (F10.5.12)
NDTHG(I) Y or θ	NOTE: Same as N1 cards except for Y or θ direction. Maximum of MAXTFG.						Card N2 (F10.5.12)
ZGRID							
ZG(R) Z	NOTE: Same as L1 cards except for Z direction. Maximum of MAXGGL.						Card L3 (F10.5.13)
NDZG(R) Z	NOTE: Same as N1 cards except for Z direction. Maximum of MAXZFG.						Card N3 (F10.5.13)

Table 3.4 (Contd.)

ANALYTICAL FUNCTIONS					
NANALT(I) Analytical function number.	NPARM(I) Number of coefficients on A2 cards. Maximum MAXPAR.			NOTE: A1 and A2 establish the mth anlytical function in the form: $F_m(V)=A_{m,1}+A_{m,2}V+A_{m,3}V^2+A_{m,4}\cos(A_{m,5}V)+A_{m,6}\exp(A_{m,7}V)$ $+A_{m,8}\sin(A_{m,9}V)+A_{m,10}\ln(A_{m,11}V)$	Card A1 (F10.5.14) Maximum MAXANA
NPRM(I) Coefficient index, i.	A(NPRM) (R) Coefficient value, $A_{m,i}$.	NPRM(I) Coefficient index, i.	A(NPRM) (R) Coefficient value, $A_{m,i}$.	NOTE: Maximum of MAXPAR coefficients. NOTE: To indicate a user supplied function, the second entry on Card A1 is zero and Card A2 is ommitted.	Card A2 (F10.5.14)
TABULAR FUNCTIONS					
NTABL(I) Tabular function number.	NTBPRS(I) Number of pairs in table. Maximum MAXPRS.			NOTE: The code uses linear interpolation to obtain the value of this function.	Card T1 (F10.5.15) Maximum MAXTBL
ARG(1) (R) Independent variable.	VAL(1) (R) Corresponding function value.	ARG(2) (R) Independent variable.	VAL(2) (R) Corresponding function value.	NOTE: Maximum of MAXPRS pairs.	Card T2 (F10.5.15)
PRINTOUT TIMES					
PRTIME(R) First time printout is desired.	PRTIME(R) Second time printout is desired.	PRTIME(R) Third time printout is desired.		NOTE: Maximum of MAXPRT printout times.	Card O (F10.5.16)
NODES MONITORED					
NDS(I) Node number.	NDS(I) Node number.	NDS(I) Node number.		NOTE: Maximum of MAXNSN nodes.	Card S (F10.5.17)
SPECIFIED PLANE OUTPUTS					
PRSPEC(R) First time printout of specified planes is desired.	PRSPEC(R) Second time printout of specified planes is desired.	PRSPEC(R) Third time printout of specified planes is desired.		NOTE: Maximum of MAXSPC printout times.	Card SO (F10.5.18)
PLANES PRINTED					
PLN(A) Axis indicator. XY or RT XZ or RZ YZ or TZ	IOINDX(I) Index of first fine lattice line defining planes desired.	IOINDX(I) Index of second fine lattice line defining planes desired.	IOINDX(I) Index of third fine lattice line defining planes desired.	NOTE: Combined maximum number of planes is MAXSPL.	Card P (F10.5.19)

Table 3.4 (Contd.)

TEMPERATURE OF NODES									
INIDES - Job description - Up to 72 alphanumeric characters.									Card IT1 (F10.5.20)
Columns 1-10	Columns 11-15	Columns 16-20	Columns 21-72						
TIMTMP(R) Initial time.	INITEM(I) Total number of lattice points with explicitly specified initial temperatures. Maximum MAXPTS.	INITXI(I) Total number of lattice points with explicitly specified initial melting ratios. Maximum MAXPTS.	NOTE : INITEM specifies number of points entered on the IT3 cards. NOTE : INITXI specifies number on IT4 cards.						Card IT2 (F10.5.20)
Columns 1-6	Columns 7-18	Columns 19-24	Columns 25-36	Columns 37-42	Columns 43-54	Columns 55-60	Columns 61-72		
NTI(I) Lattice point number.	TITMP(R) Specified initial temperature of that point.	NTI(I) Lattice point number.	TITMP(R) Specified initial temperature of that point.	Total of INITEM entries.					Card IT3 (F10.5.20)
Columns 1-5	Columns 6-10	Columns 11-20							
NXI(I) Lattice point number.	MLT(I) Material number associated with node N which is currently changing phase.	XIRATO(R) Specified initial melting ratio for point N for material MLT.	Total of INITXI entries.						Card IT4 (F10.5.20)
Entry 1	Entry 2	Entry 3	Entry 4	Entry 5	Entry 6	Entry 7	Entry 8	Entry 9	Card
STEADY STATE PARAMETERS									
NOITX(I) Maximum number of steady state iterations. (Default, 500)	EPI(R) Steady state convergence criterion. (Default, 10^{-5})	BETA(R) Steady state over-relaxation factor. $1.0 \leq \beta < 2.0$ (Default 1.9)	MCOUNT(I) Number of iterations between evaluation of temperature-dependent thermal properties for steady state cases. (Default, 1)						Card SS (F10.5.21)

Table 3.4 (Contd.)

TRANSIENT PARAMETERS								
RESDUL(R) Convergence criterion for implicit solution of transient equation. Corresponds to ϵ_1 in Eq.(F-10.2.43). (Default, 10^{-5})	MITREZ(I) Number of iterations between tests for convergence, linear loop. (default, 1)	ABSDIF(R) Convergence criterion for implicit solution of transient equation involving temperature dependent properties. Corresponds to ϵ_2 in Eq.(F10.2.46). (Default 10^{-5})	THETA(R) Parameter defining techniques for transient equation. $0.5 \leq$ THETA ≤ 1.0. 0.5 implies Crank-Nicolson, 1.0 implies Backwards Euler. Corresponds to θ in Eq. (F10.2.29). (Default 0.5)	BETAT(R) Initial value for SOR acceleration parameter. Corresponds to ω in Eq.(F10.2.37). If BETAT=0, it will be optimized empirically. If BETAT $<$ 0, it will be optimized using Carre's technique. If BETAT $>$ 0, it will be constant. $0 < \lvert$BETAT$\rvert < 2$	NUPBTA(I) Number of time steps between attempted acceleration parameter updates. Used when BETAT =0. Corresponds to N_ω in Sec. F10.2.3.3(d). (Default, 1)	ITLRCO(I) For BETAT=0 Number-of-iterations criterion which initiates acceleration parameter updates. Corresponds to I_ω in Sec. F10.2.3.3(d). (Default, 5). For BETAT $<$ 0, Number-of-iterations between SOR acceleration parameter updates. (Default, 12)	ITLRCI(I) Number of iterations criterion to terminate acceleration parameter updates. Corresponds to J_ω in Sec. F10.2.3.3(d). (Default, 2)	Card IP (F10.5.22)
DELTAT(R) Initial time step for implicit solution of transient equation. (Default, previous time step if other than first TP card.)	TSFACT(R) Factor by which the current time step is multiplied at each time step. (Default, 1.0)	TSMAX(R) Maximum size of time step. (Default, 10^{50})	TSCHGE(R) Maximum time step for which this series of time steps applies. When the current time exceeds TSCHGE, another TP card is read. (Default, 10^{50})	TPCGMX(R) Maximum temperature change allowed at a node over a time step.	PTPCGM(R) Maximum percentage of relative change in temperature allowed at a node over a time step.	TSMIN(R) Minimum size of time step. (Default, DELTAT/10)		Card TP (F10.5.22)
¶ Data Termination Card.								(F10.5.23)

Cards for additional problems if desired.

3.5 Output of DOS-HEATING6

The output of DOS-HEATING6 consists of the standard HEATING6 output plus new output information which as been added to aid in interpreting the nuclear heating analysis. The following new edit features appear in DOS-HEATING6:

(a) Listing of the DOT-4 parameters, and the radial and axial meshes as read from the input VARFLM file.

(b) Listing of the kerma factors by material and group.

(c) Listing of the volumetric nuclear heating source by node.

(d) Values for the integrated nuclear heat generation rate and the mass for each material region, and for the entire problem configuration.

3.6 JCL for Running on ORNL IBM Mainframe

The DOS-HEATING6 program is set up to execute under the DOS driver, and is accessed similarly to other modules in this system, by preceding the card input with a card containing,

= HEATING6

beginning in column one.

The DOS-HEATING6 code can also be run in conjunction with other DOS modules (e.g., DOT-IV), as illustrated in the sample problem given in section 4. A DD card is required for the DOT VARFLM flux input, corresponding to the logical unit number assigned by the value of "IDOT" in the NAMELIST /OPTION/ input. This NAMELIST /OPTION/ is also used to

optionally assign logical unit numbers for the input temperature guess, output temperature data set, plot data set, material properties library, etc. The user must supply DD cards for all logical units requested in this input. A scratch unit (default = Logical unit 4) is used to write the card data on during the input processing.

Figure 3.6 shows typical JCL for executing DOS-HEATING6 under the ORNL DOS driver on the X-10 IBM 3033 computer.

```
//XMWH6 JOB ... etc.
//  EXEC DOS,REG=640K
//GO.STEPLIB DD
//           DD DSN=XMW.MODLOAD,DISP=SHR
//GO.FTXXF001 DD ... etc.
//GO.SYSIN DD *
=HEATING6
(remainder of input goes here)
=END
//
```

NOTE: The value of "XX" is set by the parameter "IDOT" in the DOS-HEATING6 input. The logical unit will contain the DOT-IV VARFLM flux file.

Figure 3.6 JCL for Executing DOS-HEATING6 on ORNL IBM 3033 Computer

Section 4.0 SAMPLE CALCULATION

A model of the SP-100 space reactor has been analyzed to illustrate the capability of DOS-HEATING6. The SP-100 reactor is currently being designed to be placed in earth orbit and produce ∿ 100 KW of power for defense and/or civilian space applications. The reactor analyzed in this report is an early conceptual design proposed by General Electric (G.E.) in August 1984.[6] This particular SP-100 design has been modified since that time, but it will serve well as a sample problem to show the ability of coupled DOT-4 and DOS-HEATING6 calculations to treat very complex, real-world configurations.

The SP-100 configuration consists of a cylindrical, liquid-metal fast reactor core approximately 18 cm in radius and 26 cm in height. The core produces 2 MW_{th} of thermal power. Above the core is a shield region which protects the payload from neutron and gamma radiation. The shield is composed mostly of LiH pressed in a stainless steel honeycomb structure for neutron shielding and tungsten for gamma shielding. The neutron and gamma interactions in the shield will produce significant nuclear heating that can result in substantial peak temperatures, depending on the specific shield design. It is generally desired to maintain shield temperatures at all points to be on the order of 600-680°K to reduce swelling and prevent loss of dissociated hydrogen in the LiH. Thus an effective shield design for this space reactor requires satisfying dose constraints as well as thermal constraints, subject to severe weight limitations that must be met to facilitate launching into orbit.[8] Coupled neutron/photon transport and heat conduction calculations must be performed to evaluate the shield design.

4.1 SP-100 Model Used In Analysis

Figure 4.1 shows the RZ model of the SP-100 model used in the radiation transport and heat conduction analysis. The model includes the core and reflector regions near the bottom of the figure, followed by the shield region which extends to the top of the figure. The payload will be located at on axial location 25 meters from the core midplane. This shield in this particular preliminary design proposed by G.E. includes an enriched ^{7}LiH region near the reactor side of the shield to help minimize nuclear heating. It also included aluminum conductor strips to ($\sim$ 8mm thick) conduct the heat radially to the surface of the shield. Some multi-foil insulating gaps with an emissivity of .02 are also embedded in the shield to partially insulate the tungsten gamma shield. The unusual shape of the shield is chosen to minimize its weight, while meeting dose constraints in the payload section. The weight of the shield in this particular model is calculated to be 716 kg.

The top and bottom surface of the shield as well as the outer radial surface above Z = 89 cm are insulated. Heat is radiated from the shield through a 2mm thick aluminum radiator surface (emissivity = 0.8) along the outer surface below Z = 89 cm, shown in figure 4.1. An ambient temperature of 0°K was assumed.

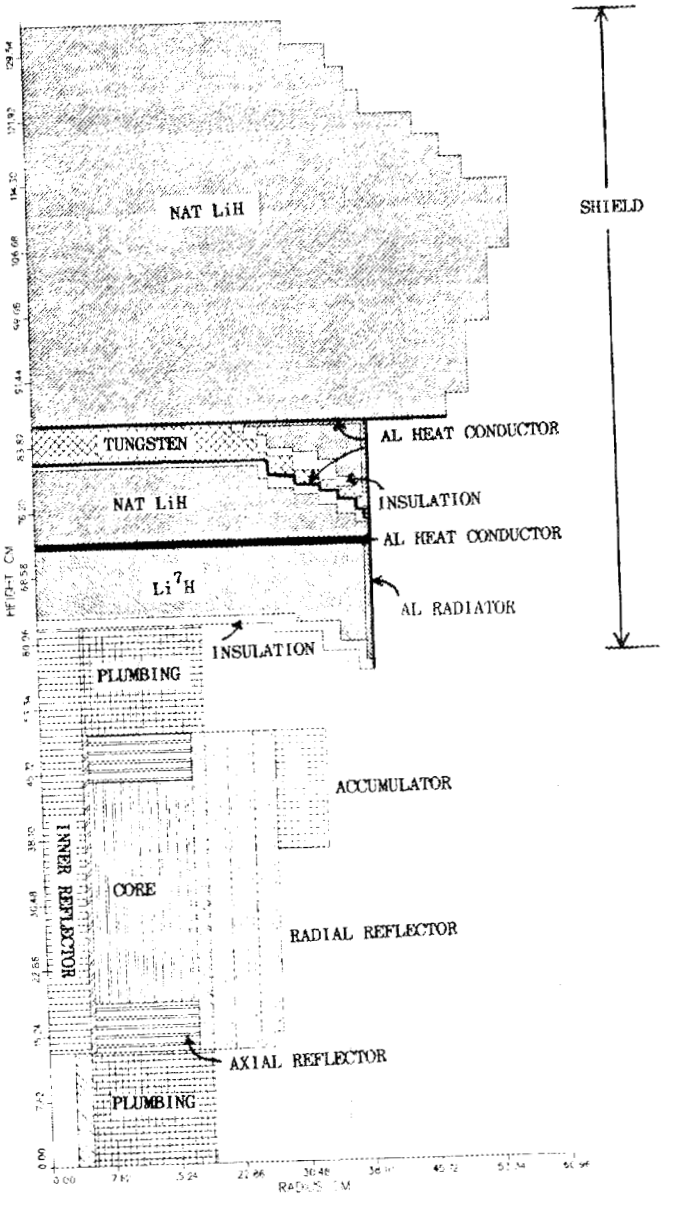

Figure 4.1 Model of SP-100 Reactor and Shield Used In Sample Calculations

4.2 Coupled DOT-4 and DOS-HEATING6 Sample Calculation

The nuclear heating analysis of the model shown in figure 4.1 required two DOT-4 transport calculations and a DOS-HEATING6 conduction calculation. Both DOT calculations used a P3 Legendre expansion and an S6 quadrature. The first DOT calculation was a 22 neutron-group, RZ geometry, eigenvalue calculation to obtain the core fission source and appropriate neutron flux distribution. The fission source was normalized to a value of 1.55×10^{17} neutrons/s. The neutron fluxes from this run were input to a coupled 22 neutron/10 gamma group, RZ DOT calculation in order to obtain the final neutron and gamma fluxes throughout the configuration. The output fluxes from the second DOT calculation are used in DOS-HEATING6 to compute the nuclear heating source and the resulting temperature distribution. The DOS-HEATING6 calculation was performed only for the shield region which was the focus of the nuclear heating analysis. The DOT geometry of course includes both the reactor and the shield regions. The second DOT-4 calculation and the RZ DOS-HEATING6 calculation were executed in a single DOS job step to illustrate how the transport and conduction codes can be easily coupled to perform the entire nuclear heating analysis.

It can be seen that the geometry for the SP-100 shield is quite complicated. A total of 2691 nodes were required to model the configuration in DOS-HEATING6. Cross sections for the various materials were obtained from the 22/10 group structure VELM library.[9] Kerma factors in this group structure were obtained from L.R. Williams at

Table 4.1 Temperature-Dependent Thermal Conductivities [1] Used in DOS-HEATING6 Calculations

Material	Conductivity $\frac{W}{cm\text{-}°K}$ vs. Temperature (°K)
LiH/SS Honeycomb Shield	0.07113 @ 600°; 0.06276 @ 800°
Aluminum	9 pairs between 2.36 @ 273° to 2.13 @ 900°
Insulation (gap)	K=0 (heat transferred across gap by radiation with emissivity = 0.02)
Tungsten	12 pairs between 1.82 @ 273 to 1.09 @ 1500°
Beryllium	7 pairs between 1.82 @ 298° to 0.4937 @ 1556°

[1] Actual values interpolated from the tabulated values shown

ORNL.[10] A listing of these values is given in the DOS-HEATING6 output shown in Appendix B. Table 4.1 shows the temperature-dependent thermal conductivity values for various materials used in the conduction calculations.

4.3 Results of Sample Calculation

Due to the unusual heat flow paths and non-linearities (e.g., temperature-dependent thermal properties and radiative boundaries) in the SP-100 model, this sample problem is a severe test of the numerical algorithms in HEATING6. Some difficulty was originally encountered in getting the DOS-HEATING6 results converged. It was observed that two different initial temperature guesses would converge to different final answers. It was finally discovered that this was due to a rather strange "false convergence" problem. The calculation was converging so slowly between iterations that the default convergence criterion of 10^{-5} was satisfied before the actual solution was reached. A convergence criterion of about 10^{-12} was needed in order for the two initial guesses to give the same solution. The original HEATING6 report warns users that the code can not be used as a "black-box" and that convergence studies should be performed for difficult calculations. This analysis supports their recommendation and illustrates some of the pitfalls in performing very difficult heat conduction calculations.

The final temperature distribution obtained with the tight convergence criterion is found in the DOS-HEATING6 output, listed in a condensed form in Appendix B. Figures4.2 and 4.3 show isothermal contours and a perspective plot of the temperature distribution,

Figure 4.2 Isothermal (°K) Contours: Reference Design

respectively. The total nuclear heating in this SP100 conceptual design was computed to be about 6.33 kw. The maximum and minimum temperature values were calculated to be 880° and 532° K, respectively. These temperatures are not within the recommended range for LiH stability. Therefore this particular design is probably not appropriate for an actual SP-100 shield.

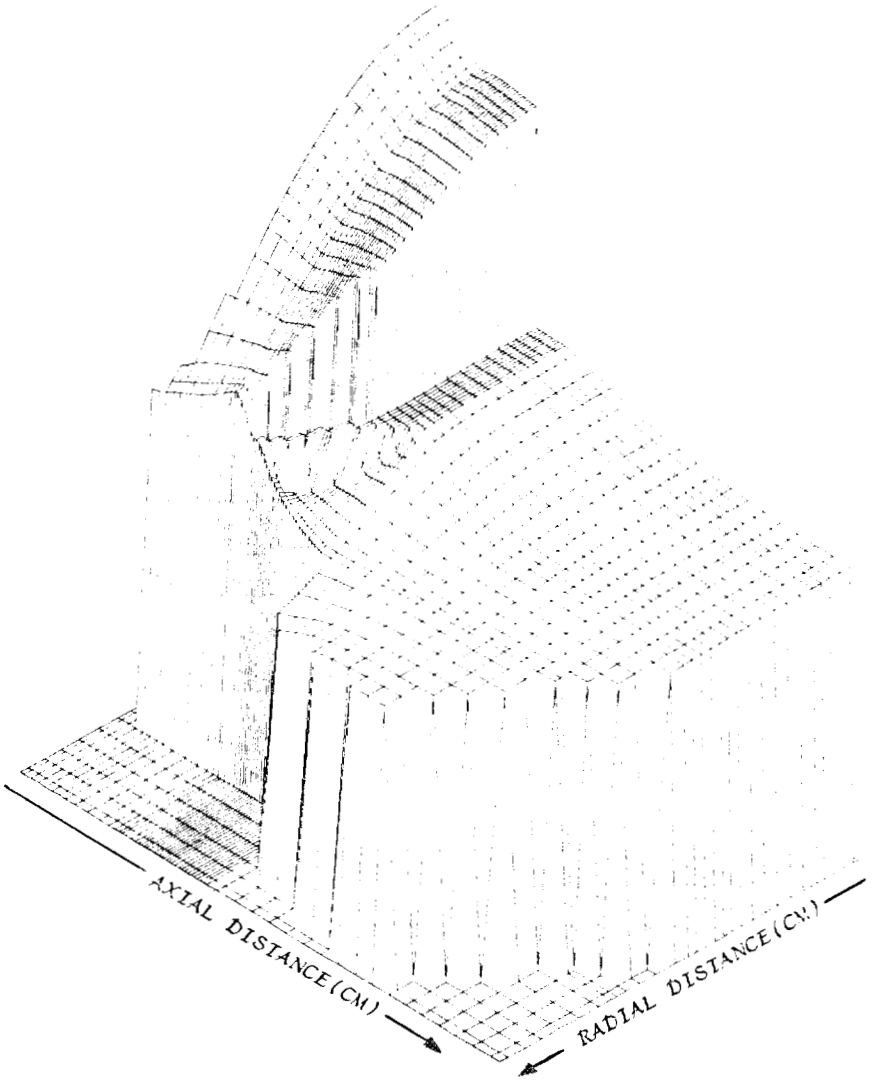

Figure 4.3 Temperature Distribution: Reference Design

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APPENDIX A. Listing of DOT-4 and DOS-HEATING6 Input for Nuclear Heating Sample Calculation

SAMPLE PROBLEM INPUT
(JCL)

```
//XMWH6 JOB (XXXXX,I30), 'M WILLIAMS B-6025',Time=(45,30),
//  NOTIFY=XMW,MSGCLASS=T
/*JOBPARM LINES=10
//  EXEC DOS,REG=640K
//GO.STEPLIB DD
//           DD DSN=XMW.MODLOAD,DISP=SHR
//GO.FT06F001 DD SYSOUT=*
//GO.FT08F001 DD UNIT=SYSDA,SPACE=(TRK,(100,20)),
//   DCB=(FECFM=VBS,BLKSIZE=6447,LRECL=X),DISP=(NEW,DELETE)
//GO.FT09F001 DD DSN=XMW.N22G10.XSLIB,DISP=SHR
//GO.FT35F001 DD UNIT=SYSDA,SPACE=(TRK,(100,20)),
//   DCB=(RECFM=VBS,BLKSIZE=6447,LRECL=X),DISP=(NEW,DELETE)
//GO.FT36F001 DD UNIT=SYSDA,SPACE=(TRK,(100,20)),
//   DCB=(RECFM=VBS,BLKSIZE=6447,LRECL=X),DISP=(NEW,DELETE)
//GO.SYSIN DD *
```

SAMPLE PROBLEM INPUT
(GIP, DOT-4, DOS-HEATING6)

```
*******INPUT CARD DECK FOR XS MIXING(USING GIP) NEEDED FOR BOTH****
*******DOT4 RUNS.                                                 ********
=GIP
 GIP : 2 MW-TH GESPR1984 : REFERENCE MODEL ; LSU
1$$      32  3  4  35  188  0  100  204  0  3  1  2  2  E
T
13$$     98I 1  100
10$$        -101    6R -105    6R -109    5R -113    3R -117    6R -121
         7R -125    4R -129    5R -133    8R -137    5R -141
         5R -145    8R -149    4R -153    6R -157    4R -161
        11R -165    2R -169   12R -173    5R -177   11R -181   12R -185
        12R -189   15R -193   13R -197   12R -201
11$$     0     0  17  21  25  61  57     0  61  57  65  29  9
         0  61  57  13  29     0  61  57     0  61  57  13  29  9
         0  89  93  29  61  57  9     0  61  57  9     0  61  57  13  29
         0  61  57  13  29  17  21  25     0  61  57  13  29
         0  61  57  13  29     0  61  57  13  29  17  21  25
         0  61  57  9     0  61  57  65  29  9
         0  65  57  29     0  9  1  97  37  45  41  53  49  61  69
         0   33     0  5  9  1  97  37  45  41  53  49  61  69
         0  73  77  81  85     0  9  1  97  37  45  41  53  49  61  69
         0  5  9  1  97  37  45  41  53  49  61  69
         0  37  45  41  53  49  61  69  65  57  29  33
         0  37  45  41  53  49  61  69  65  57  29  5  9  1  97
         0  37  45  41  53  49  61  69  33  5  9  1  97
         0  37  45  41  53  49  61  69  33  9  1  97
12**     0.0     0.0  7.278-2  8.088-3  2.022-2  5.645-3  5.701-5
    0.0  1.867-2  6.564-4  1.883-3  9.357-4  9.961-3
    0.0  2.163-3  2.185-5  6.103-2  6.103-2     0.0  4.444-2  4.489-4
    0.0  9.118-3  9.210-5  3.981-2  3.981-2  8.154-3
    0.0  1.241-2  3.838-4  2.559-2  9.118-3  9.210-3  8.154-3
    0.0  1.701-2  1.718-4  2.729-2
    0.0  4.061-3  4.102-5  5.907-2  5.907-2
    0.0  6.256-3  6.319-5  2R 3.484-2  2.764-2  3.072-3  7.680-3
    0.0  1.614-3  1.630-5  6.198-2  6.198-2
    0.0  3.830-3  3.868-5  5.935-2  5.935-2
    0.0  5.557-3  5.612-5  2R 4.029-2  2.173-2  2.415-3  6.038-3
    0.0  5.200-2  5.252-4  1.199-3
    0.0  5.779-3  5.561-4  2.004-3  9.954-4  3.393-2
    0.0  5.133-2  1.275-2  2.550-2
    0.0  5.504-2  5.503-2  8.255-6  1.974-6  3.418-6  3.162-5
         1.880-5  1.134-4  8.5444-7  8.544-7
    0.0  6.036-2
    0.0  4.167-3  5.139-2  5.555-2  8.333-6  1.974-6  3.418-6
         3.162-5  1.880-5  1.134-4  8.5444-7  8.544-7
    0.0  1.673-2  9.120-3  1.940-2  1.799-2
    0.0  5.229-2  5.228-2  7.842-6  5.121-5  8.870-5
         8.205-4  4.878-4  2.942-3  2.217-5  2.217-5
    0.0  3.923-3  4.838-2  5.230-2  7.846-6  5.960-5  1.032-4
         9.549-4  5.676-4  3.423-3  2.580-5  2.580-5
    0.0  1.410-4  2.442-4  2.259-3  1.343-3  8.100-3  2R 6.105-5
         2.200-2  5.465-3  1.093-2  2.587-2
    0.0  1.974-4  3.418-4  3.162-3  1.880-3  1.134-2  2R 8.544-5
         3.080-2  7.650-3  1.530-2  8.334-4  1.028-2  1.111-2  1.667-6
    0.0  3.710-5  6.426-5  5.945-4  3.534-4  2.131-3  2R 1.606-5
         4.328-3  3.712-3  4.577-2  4.948-2  7.422-6
    0.0  1.160-4  2.010-4  1.859-3  1.105-3  6.666-3  2R 5.024-5
         1.404-2  3.577-2  3.576-2  5.365-6
T
***********INPUT CARD DECK FOR 1ST DOT4 RUN************
```

SAMPLE INPUT, CONTINUED

```
=DOT4P3
 DOT,K CALCULATION # 1: 2 MW-TH GESPR1984(REF. MODEL);LSU
61$$    0   35   8   5Z    6   2Z    E
62$$    0   3   35    29    84   32  3  4  35  3Z   104
        0   30   1  1  0  0  0   1  -1  0  5  1  2  0  2Z  0
        4Z  1  35  0  2R 1  3Z  100  0   E
62$$    A21   8    E
62$$    A26   1    E
62$$    A29   3    A67   22   E
63**    150.0   15.5E16    1.0-3   5.0-3   1.0-3   E
    T
    T
81**    0.0  2R 4.16667-2   Q3  Q2    Q5  Q2    Q15
82**    -.36515  -.25820  +.25820  -.73030  -.68313  -.25820  +.25820
  +.68313  -.96609  -.93095  -.68313  -.25820  +.25820  +.68313  +.93095
  Q15
83**    3R-.93095  5R-.68313  7R-.25820  3R+.93095  5R+.68313  7R+.25820
    T
 1**        0.039483  0.266882  0.189023  0.167036  0.125319  0.075872
  0.044828  0.027576  0.007402  0.032457  0.013280  0.005035  0.003030
  0.000926  0.001449  0.000308  0.000054  0.000017  F 0.0
 4**
    1I 0.0  3.00  4.90  5I 5.60  17.70  1I 19.30  2I 21.90
    26.40  1I 27.50  1I 33.50  1I 37.71  2I 39.43  2I 48.69  56.36
 2**
    4I 0.0  1I 13.30  16.90  7I 18.90  3I 36.50  2I 44.70  1I 50.30
    5I 56.00  62.80  2I 63.80 69.8 70.8 71.8 72.2 72.6 73.455
    1I 74.31 8I 75.31 3I 78.91  80.50  9I 81.20  8I 86.20  3I 111.30
    3I 122.0 133.0
 8$$
    -1   1   1  29  84    -2   3   1   3   5
    -3   4   1  11   5    -4   1   6   3  23
    -5   4   6   4  23    -6   5   6  10   8
    -7   5   9  10  20    -8   5  21  10  23
    -9  11   6  11  23   -10  12   6  13  23
   -11  14   6  15  23
   -12  16   6  16  23    -12  17   7  17  23
   -13  18  17  19  23
   -14   1  24   3  31
   -15   4  24  11  31
   -16  12  24  17  31    -16  18  24  19  30
   -16  20  24  21  28    -16  22  25  23  26
   -17   1  32  18  32    -17  18  31  19  31
   -17  20  29  20  31    -17  20  29  22  29
   -17  22  27  22  29    -17  22  27  23  27
   -18   5  34  22  35    -18  20  33  22  33
   -18  22  31  22  32    -18   1  34   2  35
   -19   1  38  23  39
   -20   1  42   2  57    -20   5  42  21  57
   -21   1  59   3  67    -21   4  59  17  67
   -21  18  56  18  59    -21  19  53  19  56
   -21  20  51  20  53    -21  21  48  21  51
   -21  22  45  22  48    -21  23  43  23  45
   -22  17  62  18  66    -22  19  59  20  66
   -22  21  53  22  66
   -23   1  69   2  76    -23   5  69  26  76
   -23   5  73  28  76
   -24   1  77   2  80    -24   5  77  26  79
   -25   1  81   2  83    -25   5  82  19  83
   -26   1  33  19  33    -26  19  32  21  32
```

SAMPLE INPUT, CONTINUED

```
  -26  21  30  21  32     -26  21  30  22  30
  -26   3  33   4  37     -26   1  36  22  37
  -27   1  40  23  41     -27   3  40   4  57
  -28  22  42  23  42     -28  22  42  22  44
  -28  21  44  21  47     -28  20  47  20  50
  -28  19  50  19  52     -28  18  52  18  55
  -28  17  55  17  58     -28   1  58  17  58
  -29  23  46  23  49     -29  22  49  22  52
  -29  21  52  21  54     -29  20  54  20  58
  -29  19  57  19  60     -29  18  60  18  61
  -29  17  61  17  64     -29  16  64  16  66
  -29  15  66  15  67
  -30  23  50  23  66     -30   1  68  26  68
  -31  23  28  23  37
  -32  16  67  23  67
  -33   3  69   4  76
  -33  26  69  27  69     -33  27  69  27  72
  -33  28  72  28  75     -33  29  75  29  76
  -34   3  77   4  80
  -34  27  77  29  77     -34  26  78  27  78
  -34  25  79  26  79     -34   3  80  25  80
  -35   3  81   4  84
  -35   3  81  23  81     -35  20  82  21  82
  -35  18  83  20  83     -35   1  84  18  84
 F 0
 9$$     1  5  9  13  17  21  25  21  29  33  41  45  53  13  57  1
         61  65  69  73  77  4R 73  81  85  89  93  97  101  4R 85
25$$     25
26$$     2
27**     1.0
28$$     22R 10  10Z
 T
93**     4Z   6R 1.0   19Z    T
94**     8Z   12R 1.0   64Z    T
95**         0.039483  0.266882  0.189023  0.167036  0.125319  0.075872
  0.044828  0.027576  0.007402  0.032457  0.013280  0.005035  0.003030
  0.000926  0.001449  0.000308  0.000054  0.000017  F 0.0
 T
***********INPUT CARD DECK FOR 2ND DOT4 RUN***********
=DOT4P3
 DOT,K CALCULATION # 2: 2 MW-TH GESPR1984(REF. MODEL);LSU
61$$     35   36   8   5Z    6   2Z    E
62$$     0   3   35    29    84   32  3  4  35  3Z   104
         0   30   1  1  0  0  0   1  -1  0  5  1  2  0  2Z  0
         4Z  1  35  0  2R 1  3Z  100  0   E
62$$     A21   2    E
62$$     A26   1    E
62$$     A29   0  A67   22   E
63**     60.0   15.5E16    1.0-3   5.0-3   1.0-3   E
63**     A12  1.07533  E
    T
    T
81**     0.0  2R 4.16667-2   Q3  Q2    Q5  Q2    Q15
82**     -.36515  -.25820  +.25820  -.73030  -.68313  -.25820  +.25820
  +.68313  -.96609  -.93095  -.68313  -.25820  +.25820  +.68313  +.93095
  Q15
83**     3R-.93095  5R-.68313  7R-.25820  3R+.93095  5R+.68313  7R+.25820
    T
 1**         0.039483  0.266882  0.189023  0.167036  0.125319  0.075872
  0.044828  0.027576  0.007402  0.032457  0.013280  0.005035  0.003030
```

SAMPLE INPUT, CONTINUED

```
 0.000926  0.001449  0.000308  0.000054  0.000017  F 0.0
4**
   1I 0.0  3.00  4.90  5I 5.60  17.70  1I 19.30  2I 21.90
   26.40  1I 27.50  1I 33.50  1I 37.71  2I 39.43  2I 48.69  56.36
2**
   4I 0.0  1I 13.30  16.90  7I 18.90  3I 36.50  2I 44.70  1I 50.30
   5I 56.00  62.80  2I 63.80 69.8 70.8 71.8 72.2 72.6 73.455
   1I 74.31 8I 75.31  3I 78.91  80.50  9I 81.20  8I 86.20 3I 111.30
   3I 122.0 133.0
8$$
   -1   1   1  29  84    -2   3   1   3   5
   -3   4   1  11   5    -4   1   6   3  23
   -5   4   6   4  23    -6   5   6  10   8
   -7   5   9  10  20    -8   5  21  10  23
   -9  11   6  11  23   -10  12   6  13  23
  -11  14   6  15  23
  -12  16   6  16  23   -12  17   7  17  23
  -13  18  17  19  23
  -14   1  24   3  31
  -15   4  24  11  31
  -16  12  24  17  31   -16  18  24  19  30
  -16  20  24  21  28   -16  22  25  23  26
  -17   1  32  18  32   -17  18  31  19  31
  -17  20  29  20  31   -17  20  29  22  29
  -17  22  27  22  29   -17  22  27  23  27
  -18   5  34  22  35   -18  20  33  22  33
  -18  22  31  22  32   -18   1  34   2  35
  -19   1  38  23  39
  -20   1  42   2  57   -20   5  42  21  57
  -21   1  59   3  67   -21   4  59  17  67
  -21  18  56  18  59   -21  19  53  19  56
  -21  20  51  20  53   -21  21  48  21  51
  -21  22  45  22  48   -21  23  43  23  45
  -22  17  62  18  66   -22  19  59  20  66
  -22  21  53  22  66
  -23   1  69   2  76   -23   5  69  26  76
  -23   5  73  28  76
  -24   1  77   2  80   -24   5  77  26  79
  -25   1  81   2  83   -25   5  82  19  83
  -26   1  33  19  33   -26  19  32  21  32
  -26  21  30  21  32   -26  21  30  22  30
  -26   3  33   4  37   -26   1  36  22  37
  -27   1  40  23  41   -27   3  40   4  57
  -28  22  42  23  42   -28  22  42  22  44
  -28  21  44  21  47   -28  20  47  20  50
  -28  19  50  19  52   -28  18  52  18  55
  -28  17  55  17  58   -28   1  58  17  58
  -29  23  46  23  49   -29  22  49  22  52
  -29  21  52  21  54   -29  20  54  20  58
  -29  19  57  19  60   -29  18  60  18  61
  -29  17  61  17  64   -29  16  64  16  66
  -29  15  66  15  67
  -30  23  50  23  66   -30   1  68  26  68
  -31  23  28  23  37
  -32  16  67  23  67
  -33   3  69   4  76
  -33  26  69  27  69   -33  27  69  27  72
  -33  28  72  28  75   -33  29  75  29  76
  -34   3  77   4  80
  -34  27  77  29  77   -34  26  78  27  78
```

SAMPLE INPUT, CONTINUED

```
   -34  25  79  26  79    -34   3  80  25  80
   -35   3  81   4  84
   -35   3  81  23  81    -35  20  82  21  82
   -35  18  83  20  83    -35   1  84  18  84
  F 0
 9$$    1  5  9  13  17  21  25  21  29  33  41  45  53  13  57  1
        61  65  69  73  77  4R 73  81  85  89  93  97  101  4R 85
25$$    25
26$$    2
27**    1.0
28$$    22R 10  10R 10
  T
********DOS-HEATING6 INPUT CARD DECK*********
=HEATING6
 &OPTION MAXGGL=71,MAXMAT=9,MAXPTS=3266,MAXREG=124,MAXSUR=300,
 MAXZFG=71,MAXPRS=15,ITPOUT=37,IDOT=36,&END
DOS-HEATING6 : 2 MWTH GESPR1984(REFERENCE MODEL) ; LSU
5500 3 1 0.0 0.0 0.0 0.0 2
0 0 0 0 -1
REGIONS
1 81 0.0 3.35E1 0.0 0.0 6.38E1 6.58E1
1 1
2 81 3.05E1 3.771E1 0.0 0.0 6.28E1 6.38E1
1 1
3 81 3.5605E1 3.771E1 0.0 0.0 6.05333E1 6.28E1
1 1
4 81 3.771E1 3.857E1 0.0 0.0 6.05333E1 6.16666E1
1 1
5 65 3.771E1 3.857E1 0.0 0.0 6.16666E1 6.38E1
1 1
6 65 3.35E1 3.857E1 0.0 0.0 6.38E1 6.58E1
1 1
7 65 5.6 3.857E1 0.0 0.0 6.58E1 6.98E1
1 1
8 65 0.0 3.0 0.0 0.0 6.58E1 6.98E1
1 1
9 81 3.0 5.6 0.0 0.0 6.58E1 6.98E1
1 1
10 81 0.0 3.857E1 0.0 0.0 6.98E1 7.18E1
1 1
11 101 3.857E1 3.923E1 0.0 0.0 5.82666E1 7.18E1
1 1
12 69 0.0 3.923E1 0.0 0.0 7.18E1 7.26E1
1 1
13 85 0.0 3.923E1 0.0 0.0 7.26E1 7.431E1
1 1
14 73 0.0 3.0 0.0 0.0 7.431E1 8.12E1
1 1
15 85 3.0 5.6 0.0 0.0 7.431E1 8.12E1
1 1
16 73 5.6 2.64E1 0.0 0.0 7.431E1 8.12E1
1 1
17 73 2.64E1 2.75E1 0.0 0.0 7.431E1 7.9705E1
1 1
18 73 2.75E1 3.05E1 0.0 0.0 7.431E1 7.851E1
1 1
19 73 3.05E1 3.35E1 0.0 0.0 7.431E1 7.771E1
1 1
20 73 3.35E1 3.5605E1 0.0 0.0 7.431E1 7.651E1
1 1
```

SAMPLE INPUT, CONTINUED

```
51 73 5.6 4.25166E1 0.0 0.0 8.89889E1 1.19325E2
1 1
52 85 4.25166E1 4.56033E1 0.0 0.0 1.1665E2 1.22E2
1 1
53 85 3.0 5.6 0.0 0.0 8.89889E1 1.3025E2
1 1
54 73 0.0 3.0 0.0 0.0 8.89889E1 1.3025E2
1 1
55 85 5.6 3.943E1 0.0 0.0 1.19325E2 1.2475E2
1 1
56 85 3.943E1 4.25166E1 0.0 0.0 1.19325E2 1.22E2
1 1
57 85 3.35E1 3.771E1 0.0 0.0 1.2475E2 1.275E2
1 1
58 73 2.75E1 3.35E1 0.0 0.0 1.2475E2 1.275E2
1 1
59 85 2.75E1 3.5605E1 0.0 0.0 1.275E2 1.3025E2
1 1
60 73 5.6 2.75E1 0.0 0.0 1.2475E2 1.3025E2
1 1
61 85 0.0 3.05E1 0.0 0.0 1.3025E2 1.33E2
1 1
62 69 0.0 4.869E1 0.0 0.0 8.62E1 8.64E1
1 1 0 2 0 0 2
63 69 3.923E1 3.943E1 0.0 0.0 5.82666E1 8.62E1
1 1 0 2
64 69 0.0 2.72E1 0.0 0.0 8.14E1 8.17E1
1 1
65 69 2.72E1 2.75E1 0.0 0.0 7.98025E1 8.17E1
1 1
66 69 2.75E1 3.05E1 0.0 0.0 7.98025E1 8.01025E1
1 1
67 69 3.02E1 3.05E1 0.0 0.0 7.861E1 7.98025E1
1 1
68 69 3.05E1 3.35E1 0.0 0.0 7.861E1 7.891E1
1 1
69 69 3.32E1 3.35E1 0.0 0.0 7.781E1 7.861E1
1 1
70 69 3.35E1 3.5605E1 0.0 0.0 7.781E1 7.811E1
1 1
71 69 3.5305E1 3.5605E1 0.0 0.0 7.661E1 7.781E1
1 1
72 69 3.5605E1 3.771E1 0.0 0.0 7.661E1 7.691E1
1 1
73 69 3.741E1 3.771E1 0.0 0.0 7.541E1 7.661E1
1 1
74 69 3.771E1 3.857E1 0.0 0.0 7.541E1 7.571E1
1 1
75 69 3.827E1 3.857E1 0.0 0.0 7.451E1 7.541E1
1 1
76 69 3.857E1 3.923E1 0.0 0.0 7.451E1 7.481E1
1 1
77 0 0.0 2.64E1 0.0 0.0 8.12E1 8.14E1
0 0 0 0 0 0 4 4
78 0 2.64E1 2.72E1 0.0 0.0 7.98025E1 8.12E1
0 0 4 4
79 0 2.72E1 2.75E1 0.0 0.0 7.9705E1 7.98025E1
0 0 0 0 0 0 4 4
80 0 2.75E1 3.02E1 0.0 0.0 7.861E1 7.9705E1
0 0 4 4
```

SAMPLE INPUT, CONTINUED

```
21 73 3.5605E1 3.771E1 0.0 0.0 7.431E1 7.531E1
1 1
22 77 3.857E1 3.923E1 0.0 0.0 7.481E1 7.611E1
1 1
23 77 3.771E1 3.857E1 0.0 0.0 7.571E1 7.731E1
1 1
24 77 3.5605E1 3.771E1 0.0 0.0 7.691E1 7.851E1
1 1
25 77 3.35E1 3.5605E1 0.0 0.0 7.811E1 7.93075E1
1 1
26 77 3.05E1 3.35E1 0.0 0.0 7.891E1 8.05E1
1 1
27 77 2.75E1 3.05E1 0.0 0.0 8.01025E1 8.22E1
1 1
28 77 2.64E1 2.75E1 0.0 0.0 8.17E1 8.27E1
1 1
29 77 2.49E1 2.64E1 0.0 0.0 8.17E1 8.42E1
1 1
30 77 2.34E1 2.49E1 0.0 0.0 8.17E1 8.52E1
1 1
31 77 0.0 2.34E1 0.0 0.0 8.17E1 8.62E1
1 1
32 85 2.49E1 3.923E1 0.0 0.0 8.57E1 8.62E1
1 1
33 73 2.64E1 2.75E1 0.0 0.0 8.47E1 8.57E1
1 1
34 73 2.75E1 3.857E1 0.0 0.0 8.32E1 8.57E1
1 1
35 73 3.05E1 3.35E1 0.0 0.0 8.27E1 8.32E1
1 1
36 73 3.35E1 3.857E1 0.0 0.0 8.17E1 8.32E1
1 1
37 73 3.5605E1 3.771E1 0.0 0.0 7.9705E1 8.17E1
1 1
38 73 3.771E1 3.857E1 0.0 0.0 7.891E1 8.17E1
1 1
39 97 3.857E1 3.923E1 0.0 0.0 7.771E1 8.57E1
1 1
40 97 0.0 4.869E1 0.0 0.0 8.64E1 8.89889E1
1 1 0 2
41 85 4.869E1 5.12466E1 0.0 0.0 8.89889E1 1.00144E2
1 1 0 0 0 0 2
42 73 4.869E1 5.12466E1 0.0 0.0 1.00144E2 1.08511E2
1 1
43 85 5.12466E1 5.38033E1 0.0 0.0 9.73555E1 1.08511E2
1 1
44 85 5.38033E1 5.636E1 0.0 0.0 1.05722E2 1.13975E2
1 1
45 73 4.869E1 5.38033E1 0.0 0.0 1.08511E2 1.113E2
1 1
46 85 5.12466E1 5.38033E1 0.0 0.0 1.113E2 1.13975E2
1 1
47 85 4.869E1 5.12466E1 0.0 0.0 1.113E2 1.1665E2
1 1
48 85 4.56033E1 4.869E1 0.0 0.0 1.13975E2 1.19325E2
1 1
49 73 4.56033E1 4.869E1 0.0 0.0 8.89889E1 1.13975E2
1 1
50 73 4.25166E1 4.56033E1 0.0 0.0 8.89889E1 1.1665E2
1 1
```

SAMPLE INPUT, CONTINUED

```
81 0 3.02E1 3.05E1 0.0 0.0 7.851E1 7.861E1
0 0 0 0 0 0 4 4
82 0 3.05E1 3.32E1 0.0 0.0 7.781E1 7.851E1
0 0 4 4
83 0 3.32E1 3.35E1 0.0 0.0 7.771E1 7.781E1
0 0 0 0 0 0 4 4
84 0 3.35E1 3.5305E1 0.0 0.0 7.661E1 7.771E1
0 0 4 4
85 0 3.5305E1 3.5605E1 0.0 0.0 7.651E1 7.661E1
0 0 0 0 0 0 4 4
86 0 3.5605E1 3.741E1 0.0 0.0 7.541E1 7.651E1
0 0 4 4
87 0 3.741E1 3.771E1 0.0 0.0 7.531E1 7.541E1
0 0 0 0 0 0 4 4
88 0 3.771E1 3.827E1 0.0 0.0 7.451E1 7.531E1
0 0 4 4
89 0 3.827E1 3.923E1 0.0 0.0 7.431E1 7.451E1
0 0 0 0 0 0 4 4
90 93 2.37E1 2.49E1 0.0 0.0 8.55E1 8.62E1
1 1
91 93 2.49E1 2.64E1 0.0 0.0 8.55E1 8.57E1
1 1
92 93 2.52E1 2.64E1 0.0 0.0 8.45E1 8.55E1
1 1
93 93 2.64E1 2.75E1 0.0 0.0 8.45E1 8.47E1
1 1
94 93 2.67E1 2.75E1 0.0 0.0 83.0 8.45E1
1 1
95 93 2.75E1 3.05E1 0.0 0.0 83.0 8.32E1
1 1
96 93 2.78E1 3.05E1 0.0 0.0 8.25E1 83.0
1 1
97 93 3.05E1 3.35E1 0.0 0.0 8.25E1 8.27E1
1 1
98 93 3.08E1 3.35E1 0.0 0.0 8.08E1 8.25E1
1 1
99 93 3.35E1 3.5605E1 0.0 0.0 8.08E1 8.17E1
1 1
100 93 3.38E1 3.5605E1 0.0 0.0 7.96075E1 8.08E1
1 1
101 93 3.5605E1 3.771E1 0.0 0.0 7.96075E1 7.9705E1
1 1
102 93 3.5905E1 3.771E1 0.0 0.0 7.881E1 7.96075E1
1 1
103 93 3.771E1 3.857E1 0.0 0.0 7.881E1 7.891E1
1 1
104 93 3.801E1 3.857E1 0.0 0.0 7.761E1 7.881E1
1 1
105 93 3.857E1 3.923E1 0.0 0.0 7.761E1 7.771E1
1 1
106 93 3.887E1 3.923E1 0.0 0.0 7.611E1 7.761E1
1 1
107 0 2.34E1 2.37E1 0.0 0.0 8.55E1 8.62E1
0 0 3 3
108 0 2.37E1 2.49E1 0.0 0.0 8.52E1 8.55E1
0 0 0 0 0 0 3 3
109 0 2.49E1 2.52E1 0.0 0.0 8.45E1 8.52E1
0 0 3 3
110 0 2.52E1 2.64E1 0.0 0.0 8.42E1 8.45E1
0 0 0 0 0 0 3 3
```

SAMPLE INPUT, CONTINUED

```
111 0 2.64E1 2.67E1 0.0 0.0 83.0 8.42E1
0 0 3 3
112 0 2.67E1 2.75E1 0.0 0.0 8.27E1 83.0
0 0 0 0 0 0 3 3
113 0 2.75E1 2.78E1 0.0 0.0 8.25E1 8.27E1
0 0 3 3
114 0 2.78E1 3.05E1 0.0 0.0 8.22E1 8.25E1
0 0 0 0 0 0 3 3
115 0 3.05E1 3.08E1 0.0 0.0 8.08E1 8.22E1
0 0 3 3
116 0 3.08E1 3.35E1 0.0 0.0 8.05E1 8.08E1
0 0 0 0 0 0 3 3
117 0 3.35E1 3.38E1 0.0 0.0 7.96075E1 8.05E1
0 0 3 3
118 0 3.38E1 3.5605E1 0.0 0.0 7.93075E1 7.96075E1
0 0 0 0 0 0 3 3
119 0 3.5605E1 3.5905E1 0.0 0.0 7.881E1 7.93075E1
0 0 3 3
120 0 3.5905E1 3.771E1 0.0 0.0 7.851E1 7.881E1
0 0 0 0 0 0 3 3
121 0 3.771E1 3.801E1 0.0 0.0 7.761E1 7.851E1
0 0 3 3
122 0 3.801E1 3.857E1 0.0 0.0 7.731E1 7.761E1
0 0 0 0 0 0 3 3
123 0 3.857E1 3.887E1 0.0 0.0 7.611E1 7.731E1
0 0 3 3
124 85 4.56033E1 4.869E1 0.0 0.0 8.89889E1 9.17778E1
1 1
MATERIALS
65 LIH7 0.0 0.8342 0.0 -65
6.86071E-14 4.62515E-14 3.26343E-14 2.63032E-14 2.07477E-14
@ 1.65707E-14 1.40198E-14 1.25003E-14 1.28275E-14 9.94312E-15
@ 6.31819E-15 4.53863E-15 3.20830E-15 2.32954E-15 1.3455E-15
@ 5.01102E-16 1.95711E-16 8.27305E-17 5.97135E-17 1.04781E-16
@ 2.68176E-16 2.62375E-15 1.5828E-14 1.19834E-14 9.85347E-15
@ 7.23232E-15 4.54723E-15 2.75463E-15 1.59312E-15 6.56818E-16
@ 2.84417E-16 1.15332E-15
69 AL 0.0 2.703 0.0 -69
1.19086E-14 3.54145E-15 2.52577E-15 1.95547E-15 1.58130E-15
@ 1.24654E-15 1.07185E-15 8.16292E-16 8.80489E-16 6.14638E-16
@ 5.30431E-16 2.3084E-16 3.17411E-16 1.89579E-16 4.73329E-17
@ 8.28214E-17 3.49411E-17 2.66887E-17 4.47260E-17 9.56392E-17
@ 2.51275E-16 2.48433E-15 8.36566E-14 5.33944E-14 3.99992E-14
@ 2.66513E-14 1.59422E-14 9.63219E-15 5.59262E-15 2.46829E-15
@ 2.45032E-15 2.35969E-14
73 LIHNAT  0.0 0.8342 0.0 -65
6.99855E-14 4.77541E-14 3.39025E-14 2.74242E-14 2.18598E-14
@ 1.7873E-14 1.58436E-14 1.61395E-14 1.98641E-14 1.75639E-14
@ 8.85869E-15 6.82880E-15 5.77110E-15 5.28257E-15 5.33971E-15
@ 7.19686E-15 1.11364E-14 2.03032E-14 4.60363E-14 1.02857E-13
@ 2.70562E-13 2.67685E-12 1.59705E-14 1.20925E-14 9.94362E-15
@ 7.29883E-15 4.58914E-15 2.78002E-15 1.60777E-15 6.62661E-16
@ 2.85827E-16 1.15383E-15
77 TUNGSTEN 0.0 19.3 0.0 -77
1.72489E-15 1.02024E-15 7.90533E-16 6.66992E-16 5.35184E-16
@ 4.03112E-16 3.25457E-16 2.77635E-16 2.56752E-16 2.41377E-16
@ 2.69189E-16 2.70346E-16 2.67643E-16 2.83283E-16 3.52157E-16
@ 7.02004E-16 1.60859E-15 4.93233E-15 6.56556E-15 3.17894E-13
@ 5.61115E-15 3.24387E-14 1.39229E-12 7.13516E-13 4.48993E-13
@ 2.31374E-13 1.24997E-13 1.06603E-13 1.45627E-13 5.05661E-13
```

SAMPLE INPUT, CONTINUED

```
@ 1.24674E-12 3.1745E-12
81 LIH7CLAD 0.0 1.18849 0.0 -65
6.61273E-14 4.41976E-14 3.11185E-14 2.50666E-14 1.976E-14
@ 1.57765E-14 1.33566E-14 1.18996E-14 1.22101E-14 9.46627E-15
@ 6.01688E-15 4.32159E-15 3.05539E-15 2.22839E-15 1.28183E-15
@ 4.78296E-16 1.89654E-16 1.37885E-16 6.34047E-17 1.05495E-16
@ 2.69125E-16 2.62704E-15 3.21360E-14 2.11064E-14 1.60874E-14
@ 1.09296E-14 6.61036E-15 4.02309E-15 2.41246E-15 1.51503E-15
@ 3.63131E-15 2.85792E-14
85 LIHNCLAD 0.0 1.24884 0.0 -65
6.69988E-14 4.52603E-14 3.20530E-14 2.59104E-14 2.06381E-14
@ 1.68668E-14 1.49602E-14 1.52230E-14 1.87290E-14 1.65593E-14
@ 8.35716E-15 6.44059E-15 5.44202E-15 4.99122E-15 5.03129E-15
@ 6.77810E-15 1.04887E-14 1.91838E-14 4.33486E-14 9.68416E-14
@ 2.54736E-13 2.52027E-12 3.50431E-14 2.27601E-14 1.72319E-14
@ 1.16206E-14 7.00042E-15 4.26254E-15 2.56551E-15 1.66650E-15
@ 4.20206E-15 3.32453E-14
93 LIHNCLAD  0.0 4.37 0.0 -65
4.44623E-14 2.6447E-14 1.80991E-14 1.44893E-14 1.14203E-14
@ 9.27469E-15 8.29490E-15 8.30887E-15 1.01678E-14 8.98205E-15
@ 4.57339E-15 3.51194E-15 2.95962E-15 2.79361E-15 2.70552E-15
@ 3.62075E-15 5.60539E-15 1.07433E-14 2.30849E-14 5.14882E-14
@ 1.35425E-13 1.33977E-12 1.78666E-13 1.03089E-13 7.21138E-14
@ 4.41634E-14 2.51570E-14 1.54258E-14 9.7772E-15 9.22546E-15
@ 3.3693E-14 2.74916E-13
97 LIHNCLAD  0.0 1.10758 0.0 -65
6.78824E-14 4.60188E-14 3.26186E-14 2.6374E-14 2.10129E-14
@ 1.71757E-14 1.52313E-14 1.5505E-14 1.90787E-14 1.68691E-14
@ 8.51149E-15 6.56014E-15 5.54347E-15 5.08079E-15 5.12669E-15
@ 6.90788E-15 1.06895E-14 1.9529E-14 4.41823E-14 9.87078E-14
@ 2.59646E-13 2.56885E-12 2.85169E-14 1.91038E-14 1.47307E-14
@ 1.01347E-14 6.17039E-15 3.75229E-15 2.23624E-15 1.32334E-15
@ 2.86773E-15 2.23137E-14
101 LIH7CLAD  0.0 1.90789 0.0 -65
6.09725E-14 3.99464E-14 2.79834E-14 2.25096E-14 1.77180E-14
@ 1.41347E-14 1.19852E-14 1.06579E-14 1.09339E-14 8.48055E-15
@ 5.39393E-15 3.87289E-15 2.73925E-15 2.01889E-15 1.15019E-15
@ 4.31105E-16 1.77014E-16 2.49776E-16 7.08017E-17 1.06767E-16
@ 2.70601E-16 2.62931E-15 6.52275E-14 3.96131E-14 2.87305E-14
@ 1.84257E-14 1.07924E-14 6.59438E-15 4.07369E-15 3.25686E-15
@ 1.04279E-14 8.42741E-14
INITIAL TEMPERATURES
1 750.0
HEAT GENERATIONS
1 0.0
BOUNDARY CONDITIONS
2 1
0.0 4.53568D-12
3 3
0.0 0.113392D-12
4 3
0.0 0.113392D-12
XGRID
0.0  0.015 1.5  3.0  4.9  5.6  7.61666  9.63333  1.165E1  1.36667E1
@ 1.56833E1  1.77E1  1.93E1  2.06E1  2.19E1  2.34E1  2.37E1
@ 2.49E1  2.52E1  2.64E1  2.67E1  2.72E1  2.75E1  2.78E1
@ 3.02E1  3.05E1  3.08E1  3.32E1  3.35E1  3.38E1  3.5305E1
@ 3.5605E1  3.5905E1  3.741E1  3.771E1  3.801E1  3.827E1
@ 3.857E1  3.887E1  3.923E1  3.943E1  4.25166E1  4.56033E1
@ 4.869E1  5.12466E1  5.38033E1  5.636E1
```

SAMPLE INPUT, CONTINUED

```
46R1
ZGRID
5.82666E1  5.94E1  6.05333E1  6.16666E1  6.28E1  6.38E1  6.58E1
@ 6.78E1  6.98E1  7.18E1  7.26E1  7.431E1  7.451E1  7.481E1
@ 7.531E1  7.541E1  7.571E1  7.611E1  7.651E1  7.661E1  7.691E1
@ 7.731E1  7.761E1  7.771E1  7.781E1  7.811E1  7.851E1  7.861E1
@ 7.881E1 7.891E1  7.93075E1 7.96075E1  7.9705E1  7.98025E1
@ 8.01025E1  8.05E1  8.08E1  8.12E1  8.14E1  8.17E1  8.22E1
@ 8.25E1  8.27E1  8.3E1  8.32E1  8.37E1  8.42E1  8.45E1  8.47E1
@ 8.52E1  8.55E1  8.57E1  8.62E1  8.64E1  8.89889E1  9.17778E1
@ 9.45666E1  9.73555E1  1.00144E2  1.02933E2  1.05722E2  1.08511E2
@ 1.113E2  1.13975E2  1.1665E2  1.19325E2  1.22E2  1.2475E2
@ 1.275E2  1.3025E2  1.33E2
70R1
TABULAR FUNCTIONS
65 2
600.0 0.071128 800.0 0.06276
69 9
273.0 2.36 300.0 2.37 350 2.40 400.0 2.40 500.0 2.37 600.0 2.32
@ 700.0 2.26 800.0 2.20 900.0 2.13
77 12
273.0 1.82 300.0 1.78 350.0 1.70 400.0 1.62 500.0 1.49 600.0 1.39
@ 700.0 1.33 800.0 1.28 900.0 1.24 1.0E3 1.21 1.1E3 1.18 1.2E3 1.15
@ 1.3E3 1.13 1.4E3 1.11 1.5E3 1.09
STEADY STATE PARAMETERS
10000 1.0D-12 0.0 20
%
=END
```

APPENDIX B. Condensed Listing of DOS-HEATING6 Output for Sample Calculation

DEFINITION OF INPUT/OUTPUT UNITS

NAME	NO	UNIT NUMBER DEFINITION
IBIN	95	BINARY INPUT DATA SET (OPTIONAL)
IECHO	3	INITIAL INPUT DATA SET
IERROR	0	ERROR MESSAGE DATA SET (OPTIONAL)
IMATLB	0	MATERIAL PROPERTIES LIBRARY DATA SET (OPTIONAL)
IN	4	STANDARD INPUT DATA SET
IO	6	STANDARD OUTPUT DATA SET
IPLOT	0	PLOT DATA SET (OPTIONAL)
IPLOTO	0	OLD PLOT DATA SET FOR RESTART CASES (OPTIONAL)
IRECLG	80	RECORD LENGTH IN SINGLE WORDS FOR BINARY DATA SET ON UNIT IBIN (MAXIMUM OF 80)
ITPIN	0	INITIAL TEMPERATURE DATA SET (OPTIONAL)
ITPOUT	0	FINAL TEMPERATURE DATA SET (OPTIONAL)
IDOT	35	DOT4 INPUT VARFLM FLUX FILE(OPTIONAL)

```
PRINT INPUT CARD IMAGES W/CARD COLUMNS INDICATED EVERY 10TH CARD--

CARD
NO./COL. 1.......10........20........30........40........50........60........70........80
    1    DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87
    2    3000 3 1 0.0 0.0 0.0 0.0 2
    3    0 0 0 0 0
    4    REGIONS
    5    1 81 0.0 3.35E1 0.0 0.0 6.38E1 6.58E1
    6    1 1
    7    2 81 3.05E1 3.771E1 0.0 0.0 6.28E1 6.38E1
    8    1 1
    9    3 81 3.5605E1 3.771E1 0.0 0.0 6.05333E1 6.28E1
   10    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
   11    4 81 3.771E1 3.857E1 0.0 0.0 6.05333E1 6.16666E1
   12    1 1
   13    5 65 3.771E1 3.857E1 0.0 0.0 6.16666E1 6.38E1
   14    1 1
   15    6 65 3.35E1 3.857E1 0.0 0.0 6.38E1 6.58E1
   16    1 1
   17    7 65 5.6 3.857E1 0.0 0.0 6.58E1 6.98E1
   18    1 1
   19    8 65 0.0 3.0 0.0 0.0 6.58E1 6.98E1
   20    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
   21    9 81 3.0 5.6 0.0 0.0 6.58E1 6.98E1
   22    1 1
   23    10 81 0.0 3.857E1 0.0 0.0 6.98E1 7.18E1
   24    1 1
   25    11 101 3.857E1 3.923E1 0.0 0.0 5.82666E1 7.18E1
   26    1 1
   27    12 69 0.0 3.923E1 0.0 0.0 7.18E1 7.26E1
   28    1 1
   29    13 85 0.0 3.923E1 0.0 0.0 7.26E1 7.431E1
   30    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
   31    14 73 0.0 3.0 0.0 0.0 7.431E1 8.12E1
   32    1 1
   33    15 85 3.0 5.6 0.0 0.0 7.431E1 8.12E1
   34    1 1
   35    16 73 5.6 2.64E1 0.0 0.0 7.431E1 8.12E1
   36    1 1
   37    17 73 2.64E1 2.75E1 0.0 0.0 7.431E1 7.9705E1
   38    1 1
   39    18 73 2.75E1 3.05E1 0.0 0.0 7.431E1 7.851E1
   40    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
   41    19 73 3.05E1 3.35E1 0.0 0.0 7.431E1 7.771E1
   42    1 1
   43    20 73 3.35E1 3.5605E1 0.0 0.0 7.431E1 7.651E1
   44    1 1
   45    21 73 3.5605E1 3.771E1 0.0 0.0 7.431E1 7.531E1
   46    1 1
   47    22 77 3.857E1 3.923E1 0.0 0.0 7.481E1 7.611E1
   48    1 1
   49    23 77 3.771E1 3.857E1 0.0 0.0 7.571E1 7.731E1
   50    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
   51    24 77 3.5605E1 3.771E1 0.0 0.0 7.691E1 7.851E1
```

```
  52    1 1
  53    25 77 3.35E1 3.5605E1 0.0 0.0 7.811E1 7.93075E1
  54    1 1
  55    26 77 3.05E1 3.35E1 0.0 0.0 7.891E1 8.05E1
  56    1 1
  57    27 77 2.75E1 3.05E1 0.0 0.0 8.01025E1 8.22E1
  58    1 1
  59    28 77 2.64E1 2.75E1 0.0 0.0 8.17E1 8.27E1
  60    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
  61    29 77 2.49E1 2.64E1 0.0 0.0 8.17E1 8.42E1
  62    1 1
  63    30 77 2.34E1 2.49E1 0.0 0.0 8.17E1 8.52E1
  64    1 1
  65    31 77 0.0 2.34E1 0.0 0.0 8.17E1 8.62E1
  66    1 1
  67    32 85 2.49E1 3.923E1 0.0 0.0 8.57E1 8.62E1
  68    1 1
  69    33 73 2.64E1 2.75E1 0.0 0.0 8.47E1 8.57E1
  70    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
  71    34 73 2.75E1 3.857E1 0.0 0.0 8.32E1 8.57E1
  72    1 1
  73    35 73 3.05E1 3.35E1 0.0 0.0 8.27E1 8.32E1
  74    1 1
  75    36 73 3.35E1 3.857E1 0.0 0.0 8.17E1 8.32E1
  76    1 1
  77    37 73 3.5605E1 3.771E1 0.0 0.0 7.9705E1 8.17E1
  78    1 1
  79    38 73 3.771E1 3.857E1 0.0 0.0 7.891E1 8.17E1
  80    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
  81    39 97 3.857E1 3.923E1 0.0 0.0 7.771E1 8.57E1
  82    1 1
  83    40 97 0.0 4.869E1 0.0 0.0 8.64E1 8.89889E1
  84    1 1 0 2
  85    41 85 4.869E1 5.12466E1 0.0 0.0 8.89889E1 1.00144E2
  86    1 1 0 0 0 0 2
  87    42 73 4.869E1 5.12466E1 0.0 0.0 1.00144E2 1.08511E2
  88    1 1
  89    43 85 5.12466E1 5.38033E1 0.0 0.0 9.73555E1 1.08511E2
  90    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
  91    44 85 5.38033E1 5.636E1 0.0 0.0 1.05722E2 1.13975E2
  92    1 1
  93    45 73 4.869E1 5.38033E1 0.0 0.0 1.08511E2 1.113E2
  94    1 1
  95    46 85 5.12466E1 5.38033E1 0.0 0.0 1.113E2 1.13975E2
  96    1 1
  97    47 85 4.869E1 5.12466E1 0.0 0.0 1.113E2 1.1665E2
  98    1 1
  99    48 85 4.56033E1 4.869E1 0.0 0.0 1.13975E2 1.19325E2
 100    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
 101    49 73 4.56033E1 4.869E1 0.0 0.0 8.89889E1 1.13975E2
 102    1 1
 103    50 73 4.25166E1 4.56033E1 0.0 0.0 8.89889E1 1.1665E2
 104    1 1
 105    51 73 5.6 4.25166E1 0.0 0.0 8.89889E1 1.19325E2
 106    1 1
```

```
  107    52 85 4.25166E1 4.56033E1 0.0 0.0 1.1665E2 1.22E2
  108    1 1
  109    53 85 3.0 5.6 0.0 0.0 8.89889E1 1.3025E2
  110    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
  111    54 73 0.0 3.0 0.0 0.0 8.89889E1 1.3025E2
  112    1 1
  113    55 85 5.6 3.943E1 0.0 0.0 1.19325E2 1.2475E2
  114    1 1
  115    56 85 3.943E1 4.25166E1 0.0 0.0 1.19325E2 1.22E2
  116    1 1
  117    57 85 3.35E1 3.771E1 0.0 0.0 1.2475E2 1.275E2
  118    1 1
  119    58 73 2.75E1 3.35E1 0.0 0.0 1.2475E2 1.275E2
  120    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
  121    59 85 2.75E1 3.5605E1 0.0 0.0 1.275E2 1.3025E2
  122    1 1
  123    60 73 5.6 2.75E1 0.0 0.0 1.2475E2 1.3025E2
  124    1 1
  125    61 85 0.0 3.05E1 0.0 0.0 1.3025E2 1.33E2
  126    1 1
  127    62 69 0.0 4.869E1 0.0 0.0 8.62E1 8.64E1
  128    1 1 0 2 0 0 2
  129    63 69 3.923E1 3.943E1 0.0 0.0 5.82666E1 8.62E1
  130    1 1 0 2
NO./COL. 1.......10........20........30........40........50........60........70........80
  131    64 69 0.0 2.72E1 0.0 0.0 8.14E1 8.17E1
  132    1 1
  133    65 69 2.72E1 2.75E1 0.0 0.0 7.98025E1 8.17E1
  134    1 1
  135    66 69 2.75E1 3.05E1 0.0 0.0 7.98025E1 8.01025E1
  136    1 1
  137    67 69 3.02E1 3.05E1 0.0 0.0 7.861E1 7.98025E1
  138    1 1
  139    68 69 3.05E1 3.35E1 0.0 0.0 7.861E1 7.891E1
  140    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
  141    69 69 3.32E1 3.35E1 0.0 0.0 7.781E1 7.861E1
  142    1 1
  143    70 69 3.35E1 3.5605E1 0.0 0.0 7.781E1 7.811E1
  144    1 1
  145    71 69 3.5305E1 3.5605E1 0.0 0.0 7.661E1 7.781E1
  146    1 1
  147    72 69 3.5605E1 3.771E1 0.0 0.0 7.661E1 7.691E1
  148    1 1
  149    73 69 3.741E1 3.771E1 0.0 0.0 7.541E1 7.661E1
  150    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
  151    74 69 3.771E1 3.857E1 0.0 0.0 7.541E1 7.571E1
  152    1 1
  153    75 69 3.827E1 3.857E1 0.0 0.0 7.451E1 7.541E1
  154    1 1
  155    76 69 3.857E1 3.923E1 0.0 0.0 7.451E1 7.481E1
  156    1 1
  157    77 0 0.0 2.64E1 0.0 0.0 8.12E1 8.14E1
  158    0 0 0 0 0 0 4 4
  159    78 0 2.64E1 2.72E1 0.0 0.0 7.98025E1 8.12E1
  160    0 0 4 4
NO./COL. 1.......10........20........30........40........50........60........70........80
```

```
  161    79 0 2.72E1 2.75E1 0.0 0.0 7.9705E1 7.98025E1
  162    0 0 0 0 0 0 4 4
  163    80 0 2.75E1 3.02E1 0.0 0.0 7.861E1 7.9705E1
  164    0 0 4 4
  165    81 0 3.02E1 3.05E1 0.0 0.0 7.851E1 7.861E1
  166    0 0 0 0 0 0 4 4
  167    82 0 3.05E1 3.32E1 0.0 0.0 7.781E1 7.851E1
  168    0 0 4 4
  169    83 0 3.32E1 3.35E1 0.0 0.0 7.771E1 7.781E1
  170    0 0 0 0 0 0 4 4
NO./COL. 1.......10........20........30........40........50........60........70........80
  171    84 0 3.35E1 3.5305E1 0.0 0.0 7.661E1 7.771E1
  172    0 0 4 4
  173    85 0 3.5305E1 3.5605E1 0.0 0.0 7.651E1 7.661E1
  174    0 0 0 0 0 0 4 4
  175    86 0 3.5605E1 3.741E1 0.0 0.0 7.541E1 7.651E1
  176    0 0 4 4
  177    87 0 3.741E1 3.771E1 0.0 0.0 7.531E1 7.541E1
  178    0 0 0 0 0 0 4 4
  179    88 0 3.771E1 3.827E1 0.0 0.0 7.451E1 7.531E1
  180    0 0 4 4
NO./COL. 1.......10........20........30........40........50........60........70........80
  181    89 0 3.827E1 3.923E1 0.0 0.0 7.431E1 7.451E1
  182    0 0 0 0 0 0 4 4
  183    90 93 2.37E1 2.49E1 0.0 0.0 8.55E1 8.62E1
  184    1 1
  185    91 93 2.49E1 2.64E1 0.0 0.0 8.55E1 8.57E1
  186    1 1
  187    92 93 2.52E1 2.66E1 0.0 0.0 8.45E1 8.55E1
  188    1 1
  189    93 93 2.64E1 2.75E1 0.0 0.0 8.45E1 8.47E1
  190    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
  191    94 93 2.67E1 2.75E1 0.0 0.0 83.0 8.45E1
  192    1 1
  193    95 93 2.75E1 3.05E1 0.0 0.0 83.0 8.32E1
  194    1 1
  195    96 93 2.78E1 3.05E1 0.0 0.0 8.25E1 83.0
  196    1 1
  197    97 93 3.05E1 3.35E1 0.0 0.0 8.25E1 8.27E1
  198    1 1
  199    98 93 3.08E1 3.35E1 0.0 0.0 8.08E1 8.25E1
  200    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
  201    99 93 3.35E1 3.5605E1 0.0 0.0 8.08E1 8.17E1
  202    1 1
  203    100 93 3.38E1 3.5605E1 0.0 0.0 7.96075E1 8.08E1
  204    1 1
  205    101 93 3.5605E1 3.771E1 0.0 0.0 7.96075E1 7.9705E1
  206    1 1
  207    102 93 3.5905E1 3.771E1 0.0 0.0 7.881E1 7.96075E1
  208    1 1
  209    103 93 3.771E1 3.857E1 0.0 0.0 7.881E1 7.891E1
  210    1 1
NO./COL. 1.......10........20........30........40........50........60........70........80
  211    104 93 3.801E1 3.857E1 0.0 0.0 7.761E1 7.881E1
  212    1 1
  213    105 93 3.857E1 3.923E1 0.0 0.0 7.761E1 7.771E1
  214    1 1
  215    106 93 3.887E1 3.923E1 0.0 0.0 7.611E1 7.761E1
```

```
  216    1 1
  217    107 0 2.34E1 2.37E1 0.0 0.0 8.55E1 8.62E1
  218    0 0 3 3
  219    108 0 2.37E1 2.49E1 0.0 0.0 8.52E1 8.55E1
  220    0 0 0 0 0 0 3 3
NO./COL. 1.......10........20........30........40........50........60........70........80
  221    109 0 2.49E1 2.52E1 0.0 0.0 8.45E1 8.52E1
  222    0 0 3 3
  223    110 0 2.52E1 2.64E1 0.0 0.0 8.42E1 8.45E1
  224    0 0 0 0 0 0 3 3
  225    111 0 2.64E1 2.67E1 0.0 0.0 83.0 8.42E1
  226    0 0 3 3
  227    112 0 2.67E1 2.75E1 0.0 0.0 8.27E1 83.0
  228    0 0 0 0 0 0 3 3
  229    113 0 2.75E1 2.78E1 0.0 0.0 8.25E1 8.27E1
  230    0 0 3 3
NO./COL. 1.......10........20........30........40........50........60........70........80
  231    114 0 2.78E1 3.05E1 0.0 0.0 8.22E1 8.25E1
  232    0 0 0 0 0 0 3 3
  233    115 0 3.05E1 3.08E1 0.0 0.0 8.08E1 8.22E1
  234    0 0 3 3
  235    116 0 3.08E1 3.35E1 0.0 0.0 8.05E1 8.08E1
  236    0 0 0 0 0 0 3 3
  237    117 0 3.35E1 3.38E1 0.0 0.0 7.96075E1 8.05E1
  238    0 0 3 3
  239    118 0 3.38E1 3.5605E1 0.0 0.0 7.93075E1 7.96075E1
  240    0 0 0 0 0 0 3 3
NO./COL. 1.......10........20........30........40........50........60........70........80
  241    119 0 3.5605E1 3.5905E1 0.0 0.0 7.881E1 7.93075E1
  242    0 0 3 3
  243    120 0 3.5905E1 3.771E1 0.0 0.0 7.851E1 7.881E1
  244    0 0 0 0 0 0 3 3
  245    121 0 3.771E1 3.801E1 0.0 0.0 7.761E1 7.851E1
  246    0 0 3 3
  247    122 0 3.801E1 3.857E1 0.0 0.0 7.731E1 7.761E1
  248    0 0 0 0 0 0 3 3
  249    123 0 3.857E1 3.887E1 0.0 0.0 7.611E1 7.731E1
  250    0 0 3 3
NO./COL. 1.......10........20........30........40........50........60........70........80
  251    124 85 4.56033E1 4.869E1 0.0 0.0 8.89889E1 9.17778E1
  252    1 1
  253    MATERIALS
  254    65 LIN7 0.0 0.8342 0.0 -65
  255    6.86071E-14 4.62515E-14 3.26343E-14 2.63032E-14 2.07477E-14
  255    @ 1.65707E-14 1.40198E-14 1.25003E-14 1.28275E-14 9.94312E-15
  255    @ 6.31819E-15 4.53863E-15 3.20830E-15 2.32954E-15 1.3455E-15
  255    @ 5.01102E-16 1.95711E-16 8.27305E-17 5.97135E-17 1.04781E-16
  255    @ 2.68176E-16 2.62375E-15 1.5828E-14 1.19834E-14 9.85347E-15
  255    @ 7.23232E-15 4.54723E-15 2.75463E-15 1.59312E-15 6.56818E-16
NO./COL. 1.......10........20........30........40........50........60........70........80
  255    @ 2.84417E-16 1.15332E-15
  256    69 AL 0.0 2.703 0.0 -69
  257    1.19086E-14 3.5414SE-15 2.52577E-15 1.95547E-15 1.58130E-15
  257    @ 1.24654E-15 1.07185E-15 8.16292E-16 8.80489E-16 6.14638E-16
  257    @ 5.30431E-16 2.3084E-16 3.17411E-16 1.89579E-16 4.73329E-17
  257    @ 8.28214E-17 3.49411E-17 2.66887E-17 4.47260E-17 9.56392E-17
  257    @ 2.51275E-16 2.48433E-15 8.36566E-14 5.33944E-14 3.99992E-14
  257    @ 2.66513E-14 1.59422E-14 9.63219E-15 5.59262E-15 2.46829E-15
  257    @ 2.45032E-15 2.35969E-14
  258    73 LIHNAT  0.0 0.8342 0.0 -65
```

```
NO./COL. 1.......10........20........30........40........50........60........70........80
  259    6.99855E-14 4.77541E-14 3.39025E-14 2.74242E-14 2.18598E-14
  259    @ 1.7873E-14 1.58436E-14 1.61395E-14 1.98641E-14 1.75639E-14
  259    @ 8.85869E-15 6.82880E-15 5.77110E-15 5.28257E-15 5.33971E-15
  259    @ 7.19686E-15 1.11364E-14 2.03032E-14 4.60363E-14 1.02857E-13
  259    @ 2.70562E-13 2.67685E-12 1.59705E-14 1.20925E-14 9.94362E-15
  259    @ 7.29883E-15 4.58914E-15 2.78002E-15 1.60777E-15 6.62661E-16
  259    @ 2.85827E-16 1.15383E-15
  260    77 TUNGSTEN 0.0 19.3 0.0 -77
  261    1.72489E-15 1.02024E-15 7.90533E-16 6.66992E-16 5.35184E-16
  261    @ 4.03112E-16 3.25457E-16 2.77635E-16 2.56752E-16 2.41377E-16
NO./COL. 1.......10........20........30........40........50........60........70........80
  261    @ 2.69189E-16 2.70346E-16 2.67643E-16 2.83283E-16 3.52157E-16
  261    @ 7.02004E-16 1.60859E-15 4.93233E-15 6.56556E-15 3.17894E-13
  261    @ 5.61115E-15 3.24387E-14 1.39229E-12 7.13516E-13 4.48993E-13
  261    @ 2.31374E-13 1.24997E-13 1.06603E-13 1.45627E-13 5.05661E-13
  261    @ 1.24674E-12 3.1745E-12
  262    81 LIN7CLAD 0.0 1.18849 0.0 -65
  263    6.61273E-16 4.41976E-14 3.11185E-14 2.50666E-14 1.976E-14
  263    @ 1.57765E-14 1.33566E-14 1.18996E-14 1.22101E-14 9.46627E-15
  263    @ 6.01688E-15 4.32159E-15 3.05539E-15 2.22839E-15 1.28183E-15
  263    @ 4.78296E-16 1.89654E-16 1.37885E-16 6.34047E-17 1.05495E-16
NO./COL. 1.......10........20........30........40........50........60........70........80
  263    @ 2.69125E-16 2.62704E-15 3.21360E-14 2.11064E-14 1.60874E-14
  263    @ 1.09296E-14 6.61036E-15 4.02309E-15 2.41246E-15 1.51503E-15
  263    @ 3.63131E-15 2.85792E-14
  264    85 LIMNCLAD 0.0 1.24884 0.0 -65
  265    6.69968E-14 4.52603E-14 3.20530E-14 2.59104E-14 2.06381E-14
  265    @ 1.68668E-14 1.49602E-14 1.52230E-14 1.87290E-14 1.65593E-14
  265    @ 8.35716E-15 6.44059E-15 5.44202E-15 4.99122E-15 5.03129E-15
  265    @ 6.77810E-15 1.04887E-14 1.91838E-14 4.33486E-14 9.68416E-14
  265    @ 2.54736E-13 2.52027E-12 3.50431E-14 2.27601E-14 1.72319E-14
  265    @ 1.16206E-14 7.00042E-15 4.26254E-15 2.56551E-15 1.66650E-15
NO./COL. 1.......10........20........30........40........50........60........70........80
  265    @ 4.20206E-15 3.32453E-14
  266    93 LIMNCLAD  0.0 4.37 0.0 -65
  267    4.44623E-14 2.6447E-14 1.80991E-14 1.44893E-14 1.14203E-14
  267    @ 9.27469E-15 8.29490E-15 8.30887E-15 1.01678E-14 8.98205E-15
  267    @ 4.57339E-15 3.51194E-15 2.95962E-15 2.79361E-15 2.70552E-15
  267    @ 3.62073E-15 5.60539E-15 1.07433E-14 2.30849E-14 5.14882E-14
  267    @ 1.35425E-13 1.33977E-12 1.78666E-13 1.03089E-13 7.21138E-14
  267    @ 4.41634E-14 2.51570E-14 1.54258E-14 9.7772E-15 9.22546E-15
  267    @ 3.3693E-14 2.74916E-13
  268    97 LIMNCLAD  0.0 1.10758 0.0 -65
NO./COL. 1.......10........20........30........40........50........60........70........80
  269    6.78824E-14 4.60188E-14 3.26186E-14 2.6374E-14 2.10129E-14
  269    @ 1.71757E-14 1.52313E-14 1.5505E-14 1.90787E-14 1.68691E-14
  269    @ 8.51149E-15 6.56014E-15 5.54347E-15 5.08079E-15 5.12669E-15
  269    @ 6.90788E-15 1.06895E-14 1.9529E-14 4.41823E-14 9.87078E-14
  269    @ 2.59646E-13 2.56885E-12 2.85169E-14 1.91038E-14 1.47307E-14
  269    @ 1.01367E-14 6.17039E-15 3.75229E-15 2.23624E-15 1.32334E-15
  269    @ 2.86773E-15 2.23137E-14
  270    101 LIN7CLAD  0.0 1.90789 0.0 -65
  271    6.09725E-14 3.99464E-14 2.79834E-14 2.25096E-14 1.77180E-14
  271    @ 1.41347E-14 1.19852E-14 1.06579E-14 1.09339E-14 8.48055E-15
NO./COL. 1.......10........20........30........40........50........60........70........80
  271    @ 5.39393E-15 3.87289E-15 2.73925E-15 2.01889E-15 1.15019E-15
  271    @ 4.31105E-16 1.77014E-16 2.49776E-16 7.08017E-17 1.06767E-16
  271    @ 2.70601E-16 2.62931E-15 6.52275E-14 3.96131E-14 2.87305E-14
  271    @ 1.84257E-14 1.07924E-14 6.59438E-15 4.07369E-15 3.25686E-15
```

```
  271    @ 1.04279E-14 8.42741E-14
  272    INITIAL TEMPERATURES
  273    1 750.0
  274    HEAT GENERATIONS
  275    1 0.0
  276    BOUNDARY CONDITIONS
NO./COL. 1.......10........ 0........30........40........50........60........70........80
  277    2 1
  278    0.0 4.53568D-12
  279    3 3
  280    0.0 0.113392D-12
  281    4 3
  282    0.0 0.113392D-12
  283    XGRID
  284    0.0  0.015 1.5  3.0  4.9  5.6  7.61666  9.63333  1.165E1  1.36667E1
  284    @ 1.56833E1  1.77E1  1.93E1  2.06E1  2.19E1  2.34E1  2.37E1
  284    @ 2.49E1  2.52E1  2.64E1  2.67E1  2.72E1  2.75E1  2.78E1
NO./COL. 1.......10........20........30........40........50........60........70........80
  284    @ 3.02E1  3.05E1  3.08E1  3.32E1  3.35E1  3.38E1  3.5305E1
  284    @ 3.5605E1  3.5905E1  3.741E1  3.771E1  3.801E1  3.827E1
  284    @ 3.857E1  3.887E1  3.923E1  3.943E1  4.25166E1  4.56033E1
  284    @ 4.869E1  5.12466E1  5.38033E1  5.636E1
  285    46R1
  286    ZGRID
  287    5.82666E1  5.94E1  6.05333E1  6.16666E1  6.28E1  6.38E1  6.58E1
  287    @ 6.78E1  6.98E1  7.18E1  7.26E1  7.431E1  7.451E1  7.481E1
  287    @ 7.531E1  7.541E1  7.571E1  7.611E1  7.651E1  7.661E1  7.691E1
  287    @ 7.731E1  7.761E1  7.771E1  7.781E1  7.811E1  7.851E1  7.861E1
NO./COL. 1.......10........20........30........40........50........60........70........80
  287    @ 7.881E1 7.891E1  7.93075E1 7.96075E1  7.9705E1  7.98025E1
  287    @ 8.01025E1  8.05E1  8.08E1  8.12E1  8.14E1  8.17E1  8.22E1
  287    @ 8.25E1  8.27E1  8.3E1  8.32E1  8.37E1  8.42E1  8.45E1  8.47E1
  287    @ 8.52E1  8.55E1  8.57E1  8.62E1  8.64E1  8.89889E1  9.17778E1
  287    @ 9.45666E1  9.73555E1  1.00144E2  1.02933E2  1.05722E2  1.08511E2
  287    @ 1.113E2  1.13975E2  1.1665E2  1.19325E2  1.22E2  1.2475E2
  287    @ 1.275E2  1.3025E2  1.33E2
  288    70R1
  289    TABULAR FUNCTIONS
  290    65 2
NO./COL. 1.......10........20........30........40........50........60........70........80
  291    600.0 0.071128 800.0 0.06276
  292    69 9
  293    273.0 2.36 300.0 2.37 350 2.40 400.0 2.40 500.0 2.37 600.0 2.32
  293    @ 700.0 2.26 800.0 2.20 900.0 2.13
  294    77 12
  295    273.0 1.82 300.0 1.78 350.0 1.70 400.0 1.62 500.0 1.49 600.0 1.39
  295    @ 700.0 1.33 800.0 1.28 900.0 1.24 1.0E3 1.21 1.1E3 1.18 1.2E3 1.15
  295    @ 1.3E3 1.13 1.4E3 1.11 1.5E3 1.09
  296    STEADY STATE PARAMETERS
  297    60000 1.00-12 0.0 20
NO./COL. 1.......10........20........30........40........50........60........70........80
  298    %
```

```
LIMIT (DIMENSIONS FOR THE D-ARRAY) IS     591360 WHICH USES 2311K BYTES OF CORE.
(LIMIT IS COMPUTED BY ALOCAT AND IS A FUNCTION OF THE COMPUTER CORE REQUEST.)
THE VARIABLY DIMENSIONED ARRAYS REQUIRE     221923 SINGLE WORDS OR  867K BYTES OF CORE.
THUS, THE CORE REQUIREMENTS MAY BE REDUCED BY 1442K BYTES
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CODE: HEATING6 02/12/83     DATE: 01-07-88      TIME: 17.50.48          JOBNAM: NSORNL1          COMPUTER: IBM3033/   0

HEATING6, A MULTI-DIMENSIONAL HEAT CONDUCTION CODE WITH TEMPERATURE-DEPENDENT THERMAL PROPERTIES, NON-LINEAR AND
SURFACE-TO-SURFACE BOUNDARY CONDITIONS, FINNED SURFACE ANALYSIS TECHNIQUES, AND CHANGE-OF-PHASE CAPABILITIES.
STEADY STATE MODELS MAY BE SOLVED BY EITHER OVERRELAXATION WITH EXTRAPOLATION OR BY DIRECT SOLUTION TECHNIQUES DPTSL OR DPBFA AND
DPBSL FROM LINPACK.  THE DIRECT SOLUTION TECHNIQUES ARE LIMITED TO ONE AND TWO DIMENSIONAL PROBLEMS.
TRANSIENT MODELS MAY BE SOLVED BY INPLICIT TECHNIQUES (CRANK-NICOLSON OR BACKWARDS EULER), BY LEVI'S EXPLICIT PROCEDURE, OR THE
CLASSICAL EXPLICIT PROCEDURE.  THE TIME STEP SIZE FOR THE IMPLICIT TRANSIENT CALCULATIONS MAY BE A FUNCTION OF THE MAXIMUM
TEMPERATURE CHANGE.  THE IMPLICIT TECHNIQUE MAY NOT BE USED FOR PROBLEMS INVOLVING CHANGE OF PHASE CALCULATIONS.
EACH ARRAY WHOSE LENGTH IS A FUNCTION OF THE INPUT DATA IS VARIABLY DIMENSIONED EXCEPT FOR THE NUMBER OF MATERIALS
THAT CAN CHANGE PHASE (EQUAL TO 5) AND THE NUMBER OF PARAMETERS IN AN ANALYTICAL FUNCTION (EQUAL TO 11).
HEATING6 USES THE SCALE FREE FORM READING ROUTINES TO PROCESS ITS STANDARD INPUT DATA.

HEATING6 WAS WRITTEN BY
     D.C. ELROD
     G.E. GILES
     W.D. TURNER
     COMPUTER SCIENCES DIVISION
     UNION CARBIDE CORPORATION, NUCLEAR DIVISION
     BUILDING K-1007, MAIL STOP NO. 53
     POST OFFICE BOX P
     OAK RIDGE, TENNESSEE 37830

     PHONE - 615-574-8677
             FTS 624-8677

THIS RUN WITH HEATING6 CAN HANDLE A MAXIMUM OF THE FOLLOWING PARAMETERS:
(CONTROLLED BY THE USER THROUGH NAMELIST /OPTION/ IN THE INPUT DATA OR THROUGH A BLOCK DATA SUBPROGRAM)

  MAXPTS = 3266, LATTICE POINTS
  MAXREG =  124, REGIONS
  MAXMAT =    9, MATERIALS
  MAXCP  =    5, MATERIALS WITH PHASE CHANGE CAPABILITIES (FIXED)
  MAXINT =    5, INITIAL TEMPERATURE FUNCTIONS
  MAXHGN =    5, HEAT GENERATION FUNCTIONS
  MAXBDC =    5, BOUNDARY CONDITION FUNCTIONS
  MAXPBT =    1, POSITION DEPENDENT BOUNDARY TEMPERATURES
  MAXRFG =   50, FINE GRID LINES, RADIAL (OR X)
  MAXTFG =   50, FINE GRID LINES, THETA (OR Y)
  MAXZFG =   71, FINE GRID LINES, AXIAL (OR Z)
  MAXFGL =   71, FINE GRID LINES ALONG ANY AXIS (CALCULATED)
  MAXGGL =   71, GROSS GRID LINES ALONG ANY AXIS (MAY HAVE BEEN REDUCED)
  MAXANA =    5, ANALYTICAL FUNCTIONS
  MAXPAR =   11, PARAMETERS PER ANALYTICAL FUNCTION (FIXED)
  MAXTBL =    5, TABULAR FUNCTIONS
  MAXPRS =   15, PAIRS PER TABULAR FUNCTION
  MAXPRT =   10, STANDARD PRINTOUT TIMES
  MAXNSN =    5, NODES FOR SPECIAL MONITORING OF TEMPERATURES
  MAXSPC =   10, SPECIFIED PLANE PRINTOUT TIMES
  MAXSPL =   20, PLANES PRINTED FOR THREE DIMENSIONAL MODELS
  MAXSUR =  300, SURFACE-TO-SURFACE CONNECTORS
  MWIDTH =    7, BAND WIDTH FOR STEADY STATE DIRECT SOLUTION TECHNIQUE
  NDIMEN =    3, DIMENSIONS ALLOWED

 ANALYSIS COMPONENTS ALLOWED BY BLOCKDATA,(T), NOT ALLOWED,(F):
             CLASSICAL EXPLICIT       (   CEP=T)
             DIRECT SOLUTION (SS)     (DIRECT=T)
             LEVI EXTRAPOLATION       (  LEVI=T)
             TRANSIENT IMPLICIT       (IMPFLG=T)
             HEAT GENERATION          (  HGEN=T)
```

CHANGE OF PHASE	(MELTFG=F)
FINNED BOUNDARIES	(FIN=F)
POSITION DEPENDENT	
BOUNDARY TEMPERATURES	(LBOUND=F)

```
INPUT RETURN

JOB DESCRIPTION -- DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87
THE PROBLEM WILL BE TERMINATED AFTER                    3000 SECONDS
GEOMETRY TYPE NUMBER                                       3 (OR RZ  )
PROBLEM TYPE NUMBER                                        1
INITIAL TIME                                               0.0
IF RADIATION IS INVOLVED, TEMPERATURE UNITS ARE ASSUMED TO BE IN ABSOLUTE DEGREES
OR NO CONVERSION WILL TAKE PLACE.
THIS IS A NEW PROBLEM.

DEFINITION OF INPUT/OUTPUT UNITS FOR CASE NUMBER    1

NAME    NO   UNIT NUMBER DEFINITION
IBIN    95   BINARY INPUT DATA SET (OPTIONAL)
IECHO    5   INITIAL INPUT DATA SET
IERROR   0   ERROR MESSAGE DATA SET (OPTIONAL)
IMATLB   0   MATERIAL PROPERTIES LIBRARY DATA SET (OPTIONAL)
IN       4   STANDARD INPUT DATA SET
IO       6   STANDARD OUTPUT DATA SET
IPLOT    0   PLOT DATA SET (OPTIONAL)
IPLOTO   0   OLD PLOT DATA SET FOR RESTART CASES (OPTIONAL)
IRECLG  80   RECORD LENGTH IN SINGLE WORDS FOR BINARY DATA SET ON UNIT IBIN (MAXIMUM OF 80)
ITPIN    0   INITIAL TEMPERATURE DATA SET (OPTIONAL)
ITPOUT   0   FINAL TEMPERATURE DATA SET (OPTIONAL)


GROUPWISE KERMA FACTORS FOR MATERIAL    65  , MATERIAL NAME - LIH7


      0     GRP  1    GRP  2    GRP  3    GRP  4    GRP  5    GRP  6    GRP  7    GRP  8    GRP  9
        1      6.86071D-14  4.62515D-14  3.26343D-14  2.63032D-14  2.07477D-14  1.65707D-14  1.40198D-14  1.25003D-14  1.28275D-14


      0     GRP 10    GRP 11    GRP 12    GRP 13    GRP 14    GRP 15    GRP 16    GRP 17    GRP 18
        1      9.94312D-15  6.31819D-15  4.53863D-15  3.20830D-15  2.32954D-15  1.34550D-15  5.01102D-16  1.95711D-16  8.27305D-17


      0     GRP 19    GRP 20    GRP 21    GRP 22    GRP 23    GRP 24    GRP 25    GRP 26    GRP 27
        1      5.97135D-17  1.04781D-16  2.68176D-16  2.62375D-15  1.58280D-14  1.19834D-14  9.85347D-15  7.23232D-15  4.54723D-15


      0     GRP 28    GRP 29    GRP 30    GRP 31    GRP 32
        1      2.75463D-15  1.59312D-15  6.56818D-16  2.84417D-16  1.15332D-15


GROUPWISE KERMA FACTORS FOR MATERIAL    69  , MATERIAL NAME - AL


      0     GRP  1    GRP  2    GRP  3    GRP  4    GRP  5    GRP  6    GRP  7    GRP  8    GRP  9
        1      1.19086D-14  3.54145D-15  2.52577D-15  1.95547D-15  1.58130D-15  1.24654D-15  1.07185D-15  8.16292D-16  8.80489D-16


      0     GRP 10    GRP 11    GRP 12    GRP 13    GRP 14    GRP 15    GRP 16    GRP 17    GRP 18
        1      6.14638D-16  5.30431D-16  2.30840D-16  3.17411D-16  1.89579D-16  4.73329D-17  8.28214D-17  3.49411D-17  2.66887D-17
```

```
0    GRP 19    GRP 20    GRP 21    GRP 22    GRP 23    GRP 24    GRP 25    GRP 26    GRP 27
 1     4.47260D-17  9.56392D-17  2.51275D-16  2.48433D-15  8.36566D-14  5.33944D-14  3.99992D-14  2.66513D-14  1.59422D-14

0    GRP 28    GRP 29    GRP 30    GRP 31    GRP 32
 1     9.63219D-15  5.59262D-15  2.46829D-15  2.45032D-15  2.35969D-14


GROUPWISE KERMA FACTORS FOR MATERIAL    73  , MATERIAL NAME - LIHMAT


0    GRP  1    GRP  2    GRP  3    GRP  4    GRP  5    GRP  6    GRP  7    GRP  8    GRP  9
 1     6.99855D-14  4.77541D-14  3.39025D-14  2.74242D-14  2.18598D-14  1.78730D-14  1.58436D-14  1.61395D-14  1.98641D-14

0    GRP 10    GRP 11    GRP 12    GRP 13    GRP 14    GRP 15    GRP 16    GRP 17    GRP 18
 1     1.75639D-14  8.85869D-15  6.82880D-15  5.77110D-15  5.28257D-15  5.33971D-15  7.19686D-15  1.11364D-14  2.03032D-14

0    GRP 19    GRP 20    GRP 21    GRP 22    GRP 23    GRP 24    GRP 25    GRP 26    GRP 27
 1     4.60363D-14  1.02857D-13  2.70562D-13  2.67685D-12  1.59705D-14  1.20925D-14  9.94362D-15  7.29883D-15  4.58914D-15

0    GRP 28    GRP 29    GRP 30    GRP 31    GRP 32
 1     2.78002D-15  1.60777D-15  6.62661D-16  2.85827D-16  1.15383D-15


GROUPWISE KERMA FACTORS FOR MATERIAL    77  , MATERIAL NAME - TUNGSTEN


0    GRP  1    GRP  2    GRP  3    GRP  4    GRP  5    GRP  6    GRP  7    GRP  8    GRP  9
 1     1.72489D-15  1.02024D-15  7.90533D-16  6.66992D-16  5.35184D-16  4.03112D-16  3.25457D-16  2.77635D-16  2.56752D-16

0    GRP 10    GRP 11    GRP 12    GRP 13    GRP 14    GRP 15    GRP 16    GRP 17    GRP 18
 1     2.41377D-16  2.69189D-16  2.70346D-16  2.67643D-16  2.83283D-16  3.52157D-16  7.02004D-16  1.60859D-15  4.93233D-15

0    GRP 19    GRP 20    GRP 21    GRP 22    GRP 23    GRP 24    GRP 25    GRP 26    GRP 27
 1     6.56556D-15  3.17894D-13  5.61115D-15  3.24387D-14  1.39229D-12  7.13516D-13  4.48993D-13  2.31374D-13  1.24997D-13

0    GRP 28    GRP 29    GRP 30    GRP 31    GRP 32
 1     1.06603D-13  1.45627D-13  5.05661D-13  1.24674D-12  3.17450D-12


GROUPWISE KERMA FACTORS FOR MATERIAL    81  , MATERIAL NAME - LIN7CLAD


0    GRP  1    GRP  2    GRP  3    GRP  4    GRP  5    GRP  6    GRP  7    GRP  8    GRP  9
 1     6.61273D-14  4.41976D-14  3.11185D-14  2.50466D-14  1.97600D-14  1.57765D-14  1.33566D-14  1.18996D-14  1.22101D-14

0    GRP 10    GRP 11    GRP 12    GRP 13    GRP 14    GRP 15    GRP 16    GRP 17    GRP 18
```

```
 1     9.46627D-15  6.01688D-15  4.32159D-15  3.05539D-15  2.22839D-15  1.28183D-15  4.78296D-16  1.89654D-16  1.37885D-16

 0    GRP 19    GRP 20    GRP 21    GRP 22    GRP 23    GRP 24    GRP 25    GRP 26    GRP 27
 1     6.34047D-17  1.05495D-16  2.69125D-16  2.62704D-15  3.21360D-14  2.11064D-14  1.60874D-14  1.09296D-14  6.61036D-15

 0    GRP 28    GRP 29    GRP 30    GRP 31    GRP 32
 1     4.02309D-15  2.41246D-15  1.51503D-15  3.63131D-15  2.85792D-14
```

GROUPWISE KERMA FACTORS FOR MATERIAL 85 , MATERIAL NAME - LIHNCLAD

```
 0    GRP  1    GRP  2    GRP  3    GRP  4    GRP  5    GRP  6    GRP  7    GRP  8    GRP  9
 1     6.69988D-14  4.52603D-14  3.20530D-14  2.59104D-14  2.06381D-14  1.68668D-14  1.49602D-14  1.52230D-14  1.87290D-14

 0    GRP 10    GRP 11    GRP 12    GRP 13    GRP 14    GRP 15    GRP 16    GRP 17    GRP 18
 1     1.65593D-14  8.35716D-15  6.44059D-15  5.44202D-15  4.99122D-15  5.03129D-15  6.77810D-15  1.04887D-14  1.91838D-14

 0    GRP 19    GRP 20    GRP 21    GRP 22    GRP 23    GRP 24    GRP 25    GRP 26    GRP 27
 1     4.33486D-14  9.68416D-14  2.54736D-13  2.52027D-12  3.50431D-14  2.27601D-14  1.72319D-14  1.16206D-14  7.00042D-15

 0    GRP 28    GRP 29    GRP 30    GRP 31    GRP 32
 1     4.26254D-15  2.56551D-15  1.66650D-15  4.20206D-15  3.32453D-14
```

GROUPWISE KERMA FACTORS FOR MATERIAL 93 , MATERIAL NAME - LIHNCLAD

```
 0    GRP  1    GRP  2    GRP  3    GRP  4    GRP  5    GRP  6    GRP  7    GRP  8    GRP  9
 1     4.44623D-14  2.64470D-14  1.80991D-14  1.44893D-14  1.14203D-14  9.27469D-15  8.29490D-15  8.30887D-15  1.01678D-14

 0    GRP 10    GRP 11    GRP 12    GRP 13    GRP 14    GRP 15    GRP 16    GRP 17    GRP 18
 1     8.98205D-15  4.57339D-15  3.51194D-15  2.95962D-15  2.79361D-15  2.70552D-15  3.62075D-15  5.60539D-15  1.07433D-14

 0    GRP 19    GRP 20    GRP 21    GRP 22    GRP 23    GRP 24    GRP 25    GRP 26    GRP 27
 1     2.30849D-14  5.14882D-14  1.35425D-13  1.33977D-12  1.78666D-13  1.03089D-13  7.21138D-14  4.41634D-14  2.51570D-14

 0    GRP 28    GRP 29    GRP 30    GRP 31    GRP 32
 1     1.54258D-14  9.77720D-15  9.22546D-15  3.36930D-14  2.74916D-13
```

GROUPWISE KERMA FACTORS FOR MATERIAL 97 , MATERIAL NAME - LIHNCLAD

```
 0    GRP  1    GRP  2    GRP  3    GRP  4    GRP  5    GRP  6    GRP  7    GRP  8    GRP  9
 1     6.78824D-14  4.60188D-14  3.26186D-14  2.63740D-14  2.10129D-14  1.71757D-14  1.52313D-14  1.55050D-14  1.90787D-14
```

```
0     GRP 10    GRP 11    GRP 12    GRP 13    GRP 14    GRP 15    GRP 16    GRP 17    GRP 18
  1      1.68691D-14  8.51149D-15  6.56014D-15  5.54347D-15  5.08079D-15  5.12669D-15  6.90788D-15  1.06895D-14  1.95290D-14

0     GRP 19    GRP 20    GRP 21    GRP 22    GRP 23    GRP 24    GRP 25    GRP 26    GRP 27
  1      4.41823D-14  9.87078D-14  2.59646D-13  2.56885D-12  2.85169D-14  1.91038D-14  1.47307D-14  1.01347D-14  6.17039D-15

0     GRP 28    GRP 29    GRP 30    GRP 31    GRP 32
  1      3.75229D-15  2.23624D-15  1.32334D-15  2.86773D-15  2.23137D-14


GROUPWISE KERMA FACTORS FOR MATERIAL   101  , MATERIAL NAME - LIH7CLAD


0     GRP  1    GRP  2    GRP  3    GRP  4    GRP  5    GRP  6    GRP  7    GRP  8    GRP  9
  1      6.09725D-14  3.99464D-14  2.79834D-14  2.25096D-14  1.77180D-14  1.41347D-14  1.19852D-14  1.06579D-14  1.09339D-14

0     GRP 10    GRP 11    GRP 12    GRP 13    GRP 14    GRP 15    GRP 16    GRP 17    GRP 18
  1      8.48055D-15  5.39393D-15  3.87289D-15  2.73925D-15  2.01889D-15  1.15019D-15  4.31105D-16  1.77014D-16  2.49776D-16

0     GRP 19    GRP 20    GRP 21    GRP 22    GRP 23    GRP 24    GRP 25    GRP 26    GRP 27
  1      7.08017D-17  1.06767D-16  2.70601D-16  2.62931D-15  6.52275D-14  3.96131D-14  2.87305D-14  1.84257D-14  1.07924D-14

0     GRP 28    GRP 29    GRP 30    GRP 31    GRP 32
  1      6.59438D-15  4.07369D-15  3.25686D-15  1.04279D-14  8.42741D-14


NUMBER OF PARAMETERS SPECIFIED BY THE INPUT DATA.

  NUMBER OF REGIONS                                  124
  NUMBER OF MATERIALS                                  9
  NUMBER OF INITIAL TEMPERATURE FUNCTIONS              1
  NUMBER OF HEAT GENERATION FUNCTIONS                  1
  NUMBER OF DIFFERENT KINDS OF BOUNDARIES              3
  NUMBER OF POINTS IN GROSS X OR R LATTICE            47
  NUMBER OF POINTS IN GROSS Y OR THETA LATTICE         1
  NUMBER OF POINTS IN GROSS Z LATTICE                 71
  NUMBER OF ANALYTIC FUNCTIONS                         0
  NUMBER OF TABULAR FUNCTIONS                          3
```

SUMMARY OF REGION DATA

NUMBERS AND FCN NUMBER				********** DIMENSIONS **********						-------- BOUNDARY NUMBERS --------					
REG. NO.	MATL NO.	INIT TEMP	HEAT GEN.	LEFT-X-OR INNER-R	RIGHT-X-OR OUTER-R	LOWER-Y-OR LEFT-THETA	UPPER-Y-OR RIGHT-THETA	REAR-Z	FRONT-Z	LF-X IN-R	RT-X OT-R	LO-Y LF-D	UP-Y RT-O	RR-Z	FT-Z
1	81	1	1	0.0	33.5000	0.0	0.0	63.8000	65.8000	0	0	0	0	0	0
2	81	1	1	30.5000	37.7100	0.0	0.0	62.8000	63.8000	0	0	0	0	0	0
3	81	1	1	35.6050	37.7100	0.0	0.0	60.5333	62.8000	0	0	0	0	0	0
4	81	1	1	37.7100	38.5700	0.0	0.0	60.5333	61.6666	0	0	0	0	0	0
5	65	1	1	37.7100	38.5700	0.0	0.0	61.6666	63.8000	0	0	0	0	0	0
6	65	1	1	33.5000	38.5700	0.0	0.0	63.8000	65.8000	0	0	0	0	0	0
7	65	1	1	5.6000	38.5700	0.0	0.0	65.8000	69.8000	0	0	0	0	0	0
8	65	1	1	0.0	3.0000	0.0	0.0	65.8000	69.8000	0	0	0	0	0	0
9	81	1	1	3.0000	5.6000	0.0	0.0	65.8000	69.8000	0	0	0	0	0	0
10	81	1	1	0.0	38.5700	0.0	0.0	69.8000	71.8000	0	0	0	0	0	0
11	101	1	1	38.5700	39.2300	0.0	0.0	58.2666	71.8000	0	0	0	0	0	0
12	69	1	1	0.0	39.2300	0.0	0.0	71.8000	72.6000	0	0	0	0	0	0
13	85	1	1	0.0	39.2300	0.0	0.0	72.6000	74.3100	0	0	0	0	0	0
14	73	1	1	0.0	3.0000	0.0	0.0	74.3100	81.2000	0	0	0	0	0	0
15	85	1	1	3.0000	5.6000	0.0	0.0	74.3100	81.2000	0	0	0	0	0	0
16	73	1	1	5.6000	26.4000	0.0	0.0	74.3100	81.2000	0	0	0	0	0	0
17	73	1	1	26.4000	27.5000	0.0	0.0	74.3100	79.7050	0	0	0	0	0	0
18	73	1	1	27.5000	30.5000	0.0	0.0	74.3100	78.5100	0	0	0	0	0	0
19	73	1	1	30.5000	33.5000	0.0	0.0	74.3100	77.7100	0	0	0	0	0	0
20	73	1	1	33.5000	35.6050	0.0	0.0	74.3100	76.5100	0	0	0	0	0	0
21	73	1	1	35.6050	37.7100	0.0	0.0	74.3100	75.3100	0	0	0	0	0	0
22	77	1	1	38.5700	39.2300	0.0	0.0	74.8100	76.1100	0	0	0	0	0	0
23	77	1	1	37.7100	38.5700	0.0	0.0	75.7100	77.3100	0	0	0	0	0	0
24	77	1	1	35.6050	37.7100	0.0	0.0	76.9100	78.5100	0	0	0	0	0	0
25	77	1	1	33.5000	35.6050	0.0	0.0	78.1100	79.3075	0	0	0	0	0	0
26	77	1	1	30.5000	33.5000	0.0	0.0	78.9100	80.5000	0	0	0	0	0	0
27	77	1	1	27.5000	30.5000	0.0	0.0	80.1025	82.2000	0	0	0	0	0	0
28	77	1	1	26.4000	27.5000	0.0	0.0	81.7000	82.7000	0	0	0	0	0	0
29	77	1	1	24.9000	26.4000	0.0	0.0	81.7000	84.2000	0	0	0	0	0	0
30	77	1	1	23.4000	24.9000	0.0	0.0	81.7000	85.2000	0	0	0	0	0	0
31	77	1	1	0.0	23.4000	0.0	0.0	81.7000	86.2000	0	0	0	0	0	0
32	85	1	1	24.9000	39.2300	0.0	0.0	85.7000	86.2000	0	0	0	0	0	0
33	73	1	1	26.4000	27.5000	0.0	0.0	84.7000	85.7000	0	0	0	0	0	0
34	73	1	1	27.5000	38.5700	0.0	0.0	83.2000	85.7000	0	0	0	0	0	0
35	73	1	1	30.5000	33.5000	0.0	0.0	82.7000	83.2000	0	0	0	0	0	0
36	73	1	1	33.5000	38.5700	0.0	0.0	81.7000	83.2000	0	0	0	0	0	0
37	73	1	1	35.6050	37.7100	0.0	0.0	79.7050	81.7000	0	0	0	0	0	0
38	73	1	1	37.7100	38.5700	0.0	0.0	78.9100	81.7000	0	0	0	0	0	0
39	97	1	1	38.5700	39.2300	0.0	0.0	77.7100	85.7000	0	0	0	0	0	0
40	97	1	1	0.0	48.6900	0.0	0.0	86.4000	88.9889	0	2	0	0	0	0
41	85	1	1	48.6900	51.2466	0.0	0.0	88.9889	100.1440	0	0	0	0	2	0
42	73	1	1	48.6900	51.2466	0.0	0.0	100.1440	108.5110	0	0	0	0	0	0
43	85	1	1	51.2466	53.8033	0.0	0.0	97.3555	108.5110	0	0	0	0	0	0
44	85	1	1	53.8033	56.3600	0.0	0.0	105.7220	113.9750	0	0	0	0	0	0
45	73	1	1	48.6900	53.8033	0.0	0.0	108.5110	111.3000	0	0	0	0	0	0
46	85	1	1	51.2466	53.8033	0.0	0.0	111.3000	113.9750	0	0	0	0	0	0
47	85	1	1	48.6900	51.2466	0.0	0.0	111.3000	116.6500	0	0	0	0	0	0
48	85	1	1	45.6033	48.6900	0.0	0.0	113.9750	119.3250	0	0	0	0	0	0
49	73	1	1	45.6033	48.6900	0.0	0.0	88.9889	113.9750	0	0	0	0	0	0
50	73	1	1	42.5166	45.6033	0.0	0.0	88.9889	116.6500	0	0	0	0	0	0
51	73	1	1	5.6000	42.5166	0.0	0.0	88.9889	119.3250	0	0	0	0	0	0
52	85	1	1	42.5166	45.6033	0.0	0.0	116.6500	122.0000	0	0	0	0	0	0
53	85	1	1	3.0000	5.6000	0.0	0.0	88.9889	130.2500	0	0	0	0	0	0
54	73	1	1	0.0	3.0000	0.0	0.0	88.9889	130.2500	0	0	0	0	0	0
55	85	1	1	5.6000	39.4300	0.0	0.0	119.3250	124.7500	0	0	0	0	0	0
56	85	1	1	39.4300	42.5166	0.0	0.0	119.3250	122.0000	0	0	0	0	0	0

57	85	1	1	33.5000	37.7100	0.0	0.0	124.7500	127.5000	0	0	0	0	0	0
58	73	1	1	27.5000	33.5000	0.0	0.0	124.7500	127.5000	0	0	0	0	0	0
59	85	1	1	27.5000	35.6050	0.0	0.0	127.5000	130.2500	0	0	0	0	0	0
60	73	1	1	5.6000	27.5000	0.0	0.0	124.7500	130.2500	0	0	0	0	0	0
61	85	1	1	0.0	30.5000	0.0	0.0	130.2500	133.0000	0	0	0	0	0	0
62	69	1	1	0.0	48.6900	0.0	0.0	86.2000	86.4000	0	2	0	0	2	0
63	69	1	1	39.2300	39.4300	0.0	0.0	58.2666	86.2000	0	2	0	0	0	0
64	69	1	1	0.0	27.2000	0.0	0.0	81.4000	81.7000	0	0	0	0	0	0
65	69	1	1	27.2000	27.5000	0.0	0.0	79.8025	81.7000	0	0	0	0	0	0
66	69	1	1	27.5000	30.5000	0.0	0.0	79.8025	80.1025	0	0	0	0	0	0
67	69	1	1	30.2000	30.5000	0.0	0.0	78.6100	79.8025	0	0	0	0	0	0
68	69	1	1	30.5000	33.5000	0.0	0.0	78.6100	78.9100	0	0	0	0	0	0
69	69	1	1	33.2000	33.5000	0.0	0.0	77.8100	78.6100	0	0	0	0	0	0
70	69	1	1	33.5000	35.6050	0.0	0.0	77.8100	78.1100	0	0	0	0	0	0
71	69	1	1	35.3050	35.6050	0.0	0.0	76.6100	77.8100	0	0	0	0	0	0
72	69	1	1	35.6050	37.7100	0.0	0.0	76.6100	76.9100	0	0	0	0	0	0
73	69	1	1	37.4100	37.7100	0.0	0.0	75.4100	76.6100	0	0	0	0	0	0
74	69	1	1	37.7100	38.5700	0.0	0.0	75.4100	75.7100	0	0	0	0	0	0
75	69	1	1	38.2700	38.5700	0.0	0.0	74.5100	75.4100	0	0	0	0	0	0
76	69	1	1	38.5700	39.2300	0.0	0.0	74.5100	74.8100	0	0	0	0	0	0
77	0	0	0	0.0	26.4000	0.0	0.0	81.2000	81.4000	0	0	0	0	4	4
78	0	0	0	26.4000	27.2000	0.0	0.0	79.8025	81.2000	4	4	0	0	0	0
79	0	0	0	27.2000	27.5000	0.0	0.0	79.7050	79.8025	0	0	0	0	4	4
80	0	0	0	27.5000	30.2000	0.0	0.0	78.6100	79.7050	4	4	0	0	0	0
81	0	0	0	30.2000	30.5000	0.0	0.0	78.5100	78.6100	0	0	0	0	4	4
82	0	0	0	30.5000	33.2000	0.0	0.0	77.8100	78.5100	4	4	0	0	0	0
83	0	0	0	33.2000	33.5000	0.0	0.0	77.7100	77.8100	0	0	0	0	4	4
84	0	0	0	33.5000	35.3050	0.0	0.0	76.6100	77.7100	4	4	0	0	0	0
85	0	0	0	35.3050	35.6050	0.0	0.0	76.5100	76.6100	0	0	0	0	4	4
86	0	0	0	35.6050	37.4100	0.0	0.0	75.4100	76.5100	4	4	0	0	0	0
87	0	0	0	37.4100	37.7100	0.0	0.0	75.3100	75.4100	0	0	0	0	4	4
88	0	0	0	37.7100	38.2700	0.0	0.0	74.5100	75.3100	4	4	0	0	0	0
89	0	0	0	38.2700	39.2300	0.0	0.0	74.3100	74.5100	0	0	0	0	4	4
90	93	1	1	23.7000	24.9000	0.0	0.0	85.5000	86.2000	0	0	0	0	0	0
91	93	1	1	24.9000	26.4000	0.0	0.0	85.5000	85.7000	0	0	0	0	0	0
92	93	1	1	25.2000	26.4000	0.0	0.0	84.5000	85.5000	0	0	0	0	0	0
93	93	1	1	26.4000	27.5000	0.0	0.0	84.5000	84.7000	0	0	0	0	0	0
94	93	1	1	26.7000	27.5000	0.0	0.0	83.0000	84.5000	0	0	0	0	0	0
95	93	1	1	27.5000	30.5000	0.0	0.0	83.0000	83.2000	0	0	0	0	0	0
96	93	1	1	27.8000	30.5000	0.0	0.0	82.5000	83.0000	0	0	0	0	0	0
97	93	1	1	30.5000	33.5000	0.0	0.0	82.5000	82.7000	0	0	0	0	0	0
98	93	1	1	30.8000	33.5000	0.0	0.0	80.8000	82.5000	0	0	0	0	0	0
99	93	1	1	33.5000	35.6050	0.0	0.0	80.8000	81.7000	0	0	0	0	0	0
100	93	1	1	33.8000	35.6050	0.0	0.0	79.6075	80.8000	0	0	0	0	0	0
101	93	1	1	35.6050	37.7100	0.0	0.0	79.6075	79.7050	0	0	0	0	0	0
102	93	1	1	35.9050	37.7100	0.0	0.0	78.8100	79.6075	0	0	0	0	0	0
103	93	1	1	37.7100	38.5700	0.0	0.0	78.8100	78.9100	0	0	0	0	0	0
104	93	1	1	38.0100	38.5700	0.0	0.0	77.6100	78.8100	0	0	0	0	0	0
105	93	1	1	38.5700	39.2300	0.0	0.0	77.6100	77.7100	0	0	0	0	0	0
106	93	1	1	38.8700	39.2300	0.0	0.0	76.1100	77.6100	0	0	0	0	0	0
107	0	0	0	23.4000	23.7000	0.0	0.0	85.5000	86.2000	3	3	0	0	0	0
108	0	0	0	23.7000	24.9000	0.0	0.0	85.2000	85.5000	0	0	0	0	3	3
109	0	0	0	24.9000	25.2000	0.0	0.0	84.5000	85.2000	3	3	0	0	0	0
110	0	0	0	25.2000	26.4000	0.0	0.0	84.2000	84.5000	0	0	0	0	3	3
111	0	0	0	26.4000	26.7000	0.0	0.0	83.0000	84.2000	3	3	0	0	0	0
112	0	0	0	26.7000	27.5000	0.0	0.0	82.7000	83.0000	0	0	0	0	3	3
113	0	0	0	27.5000	27.8000	0.0	0.0	82.5000	82.7000	3	3	0	0	0	0
114	0	0	0	27.8000	30.5000	0.0	0.0	82.2000	82.5000	0	0	0	0	3	3
115	0	0	0	30.5000	30.8000	0.0	0.0	80.8000	82.2000	3	3	0	0	0	0
116	0	0	0	30.8000	33.5000	0.0	0.0	80.5000	80.8000	0	0	0	0	3	3

117	0	0	0	33.5000	33.8000	0.0	0.0	79.6075	80.5000	3	3	0	0	0	0
118	0	0	0	33.8000	35.6050	0.0	0.0	79.3075	79.6075	0	0	0	0	3	3
119	0	0	0	35.6050	35.9050	0.0	0.0	78.8100	79.3075	3	3	0	0	0	0
120	0	0	0	35.9050	37.7100	0.0	0.0	78.5100	78.8100	0	0	0	0	3	3
121	0	0	0	37.7100	38.0100	0.0	0.0	77.6100	78.5100	3	3	0	0	0	0
122	0	0	0	38.0100	38.5700	0.0	0.0	77.3100	77.6100	0	0	0	0	3	3
123	0	0	0	38.5700	38.8700	0.0	0.0	76.1100	77.3100	3	3	0	0	0	0
124	85	1	1	45.6033	48.6900	0.0	0.0	88.9889	91.7778	0	0	0	0	0	0

********** SUMMARY OF MATERIAL DATA **********

MATERIAL NUMBER	MATERIAL NAME	---------- THERMAL PARAMETERS ---------- -- TEMPERATURE-DEPENDENT FUNCTION NUMBERS -- CONDUCTIVITY	DENSITY	SPECIFIC HEAT
65	LIH7	0.0	8.342000D-01	0.0
		-65	0	0
69	AL	0.0	2.703000D+00	0.0
		-69	0	0
73	LIHWAT	0.0	8.342000D-01	0.0
		-65	0	0
77	TUNGSTEN	0.0	1.930000D+01	0.0
		-77	0	0
81	LIH7CLAD	0.0	1.188490D+00	0.0
		-65	0	0
85	LIHWCLAD	0.0	1.248840D+00	0.0
		-65	0	0
93	LIHWCLAD	0.0	4.370000D+00	0.0
		-65	0	0
97	LIHWCLAD	0.0	1.107580D+00	0.0
		-65	0	0
101	LIH7CLAD	0.0	1.907890D+00	0.0
		-65	0	0

********** SUMMARY OF INITIAL TEMPERATURE DATA **********

NUMBER	INITIAL TEMPERATURE	POSITION-DEPENDENT FUNCTION NUMBERS X OR R	Y OR TH	Z
1	7.500000D+02	0	0	0

********** SUMMARY OF HEAT GENERATION RATE DATA **********

NUMBER	POWER DENSITY	TIME-, TEMPERATURE-, AND POSITION-DEPENDENT NUMBERS TIME	TEMPERATURE	X OR R	Y OR TH	Z
1	0.0	0	0	0	0	0

**********SUMMARY OF BOUNDARY DATA**********

-------GENERAL------			--TEMPERATURE-- INFORMATION					----------HEAT TRANSFER COEFFICIENTS---------- RELATED FUNCTION NUMBERS				
NO.	TYPE	FCT FLAG	TEMPERATURE T	X	Y	Z	ASSOC. FCTS	FORCED CONV.	RADIATION	NATURAL CONV	EXPONENT	FLUX
2	1	0	0.0					0.0	4.535680-12	0.0	0.0	0.0
			0	0	0	0						
3	3	0	0.0					0.0	1.133920-13	0.0	0.0	0.0
			0	0	0	0						
4	3	0	0.0					0.0	1.133920-13	0.0	0.0	0.0
			0	0	0	0						

GROSS LATTICES AND NUMBERS OF INCREMENTS

R OR X

0.0	0.015000	1.500000	3.000000	4.900000	5.600000	7.616660	9.633330
11.650000	13.666700	15.683300	17.700000	19.300000	20.600000	21.900000	23.400000
23.700000	24.900000	25.200000	26.400000	26.700000	27.200000	27.500000	27.800000
30.200000	30.500000	30.800000	33.200000	33.500000	33.800000	35.305000	35.605000
35.905000	37.410000	37.710000	38.010000	38.270000	38.570000	38.870000	39.230000
39.430000	42.516600	45.603300	48.690000	51.246600	53.803300	56.360000	
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1		

Z

58.266600	59.400000	60.533300	61.666600	62.800000	63.800000	65.800000	67.800000
69.800000	71.800000	72.600000	74.310000	74.510000	74.810000	75.310000	75.410000
75.710000	76.110000	76.510000	76.610000	76.910000	77.310000	77.610000	77.710000
77.810000	78.110000	78.510000	78.610000	78.810000	78.910000	79.307500	79.607500
79.705000	79.802500	80.102500	80.500000	80.800000	81.200000	81.400000	81.700000
82.200000	82.500000	82.700000	83.000000	83.200000	83.700000	84.200000	84.500000
84.700000	85.200000	85.500000	85.700000	86.200000	86.400000	88.988900	91.777800
94.566600	97.355500	100.144000	102.933000	105.722000	108.511000	111.300000	113.975000
116.650000	119.325000	122.000000	124.750000	127.500000	130.250000	133.000000	
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1
1	1	1	1	1	1		

LISTING OF TABULAR FUNCTIONS

TABLE NUMBER 65 NUMBER OF PAIRS - 2

ARGUMENT	VALUE
6.000000000+02	7.112800000-02
8.000000000+02	6.276000000-02

TABLE NUMBER 69 NUMBER OF PAIRS - 9

ARGUMENT	VALUE
2.730000000+02	2.360000000+00
3.000000000+02	2.370000000+00
3.500000000+02	2.400000000+00
4.000000000+02	2.400000000+00
5.000000000+02	2.370000000+00
6.000000000+02	2.320000000+00
7.000000000+02	2.260000000+00
8.000000000+02	2.200000000+00
9.000000000+02	2.130000000+00

TABLE NUMBER 77 NUMBER OF PAIRS - 12

ARGUMENT	VALUE
2.730000000+02	1.820000000+00
3.000000000+02	1.780000000+00
3.500000000+02	1.700000000+00
4.000000000+02	1.620000000+00
5.000000000+02	1.490000000+00
6.000000000+02	1.390000000+00
7.000000000+02	1.330000000+00
8.000000000+02	1.280000000+00
9.000000000+02	1.240000000+00
1.000000000+03	1.210000000+00
1.100000000+03	1.180000000+00
1.200000000+03	1.150000000+00

```
THE STEADY STATE MODEL WILL BE SOLVED USING OVERRELAXATION.
MAXIMUM NUMBER OF STEADY-STATE ITERATIONS                                  60000
STEADY STATE CONVERGENCE CRITERION                                   1.00000000-12
INITIAL OVERRELAXATION FACTOR (BETA) FOR STEADY STATE CALCULATIONS      1.90000000
NUMBER OF ITERATIONS BETWEEN TEMPERATURE DEPENDENT
PARAMETER EVALUATIONS FOR STEADY STATE CALCULATIONS                            20
```

FINE LATTICE LINES GENERATED BY HEATING6

X OR R FINE LATTICE LINES

2	0.015000	3	1.500000	4	3.000000	5	4.900000	6	5.600000
7	7.616660	8	9.633330	9	11.650000	10	13.666700	11	15.683300
12	17.700000	13	19.300000	14	20.600000	15	21.900000	16	23.400000
17	23.700000	18	24.900000	19	25.200000	20	26.400000	21	26.700000
22	27.200000	23	27.500000	24	27.800000	25	30.200000	26	30.500000
27	30.800000	28	33.200000	29	33.500000	30	33.800000	31	35.305000
32	35.605000	33	35.905000	34	37.410000	35	37.710000	36	38.010000
37	38.270000	38	38.570000	39	38.870000	40	39.230000	41	39.430000
42	42.516600	43	45.603300	44	48.690000	45	51.246600	46	53.803300
47	56.360000								

Z FINE LATTICE LINES

1	58.266600	2	59.400000	3	60.533300	4	61.666600	5	62.800000
6	63.800000	7	65.800000	8	67.800000	9	69.800000	10	71.800000
11	72.600000	12	74.310000	13	74.510000	14	74.810000	15	75.310000
16	75.410000	17	75.710000	18	76.110000	19	76.510000	20	76.610000
21	76.910000	22	77.310000	23	77.610000	24	77.710000	25	77.810000
26	78.110000	27	78.510000	28	78.610000	29	78.810000	30	78.910000
31	79.307500	32	79.607500	33	79.705000	34	79.802500	35	80.102500
36	80.500000	37	80.800000	38	81.200000	39	81.400000	40	81.700000
41	82.200000	42	82.500000	43	82.700000	44	83.000000	45	83.200000
46	83.700000	47	84.200000	48	84.500000	49	84.700000	50	85.200000
51	85.500000	52	85.700000	53	86.200000	54	86.400000	55	88.988900
56	91.777900	57	94.566600	58	97.355500	59	100.144000	60	102.933000
61	105.722000	62	108.511000	63	111.300000	64	113.975000	65	116.650000
66	119.325000	67	122.000000	68	124.750000	69	127.500000	70	130.250000
71	133.000000								

THIS PROBLEM INVOLVES TEMPERATURE-DEPENDENT PROPERTIES.

SINCE THIS PROBLEM INVOLVES RADIATION, 0.0 WILL BE ADDED TO
THE TEMPERATURES FOR THE RELATED HEAT FLOW CALCULATIONS TO CONVERT THEM TO ABSOLUTE TEMPERATURES.

THIS PROBLEM CONTAINS 2691 NODES.

HEATING6 R MESH
-0.150000-01 0.150000-01 0.150000+01 0.300000+01 0.490000+01 0.560000+01 0.761670+01 0.963330+01
0.116500+02 0.136670+02 0.156830+02 0.177000+02 0.193000+02 0.206000+02 0.219000+02 0.234000+02
0.237000+02 0.249000+02 0.252000+02 0.264000+02 0.267000+02 0.272000+02 0.275000+02 0.278000+02
0.302000+02 0.305000+02 0.308000+02 0.332000+02 0.335000+02 0.338000+02 0.353050+02 0.356050+02
0.359050+02 0.374100+02 0.377100+02 0.380100+02 0.382700+02 0.385700+02 0.388700+02 0.392300+02
0.394300+02 0.425170+02 0.456030+02 0.486900+02 0.512470+02 0.538030+02 0.563600+02

HEATING6 Y MESH
0.0

HEATING6 Z MESH
0.582670+02 0.594000+02 0.605330+02 0.616670+02 0.628000+02 0.638000+02 0.658000+02 0.678000+02
0.698000+02 0.718000+02 0.726000+02 0.743100+02 0.745100+02 0.748100+02 0.753100+02 0.754100+02
0.757100+02 0.761100+02 0.765100+02 0.766100+02 0.769100+02 0.773100+02 0.776100+02 0.777100+02

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0.77810D+02 0.78110D+02 0.78510D+02 0.78610D+02 0.78810D+02 0.78910D+02 0.79307D+02 0.79607D+02
0.79705D+02 0.79802D+02 0.80102D+02 0.80500D+02 0.80800D+02 0.81200D+02 0.81400D+02 0.81700D+02
0.82200D+02 0.82500D+02 0.82700D+02 0.83000D+02 0.83200D+02 0.83700D+02 0.84200D+02 0.84500D+02
0.84700D+02 0.85200D+02 0.85500D+02 0.85700D+02 0.86200D+02 0.86400D+02 0.88989D+02 0.91778D+02
0.94567D+02 0.97355D+02 0.10014D+03 0.10293D+03 0.10572D+03 0.10851D+03 0.11130D+03 0.11397D+03
0.11665D+03 0.11932D+03 0.12200D+03 0.12475D+03 0.12750D+03 0.13025D+03 0.13300D+03

 IGM,NEUT,JM,LM,IMA,ISM,IMSISM,ISBT=  32  22  84  10  29   1  29   1


 IMBIS:   29


 ISET:    1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1   1


 ZD:  0.0          0.26600E+01 0.53200E+01 0.79800E+01 0.10640E+02 0.13300E+02 0.15100E+02 0.16900E+02 0.18900E+02 0.21100E+02
 0.23300E+02 0.25500E+02 0.27700E+02 0.29900E+02 0.32100E+02 0.34300E+02 0.36500E+02 0.38550E+02 0.40600E+02 0.42650E+02
 0.44700E+02 0.46567E+02 0.48433E+02 0.50300E+02 0.53150E+02 0.56000E+02 0.57133E+02 0.58267E+02 0.59400E+02 0.60533E+02
 0.61667E+02 0.62800E+02 0.63800E+02 0.65800E+02 0.67800E+02 0.69800E+02 0.70800E+02 0.71800E+02 0.72200E+02 0.72600E+02
 0.73455E+02 0.74310E+02 0.74810E+02 0.75310E+02 0.75710E+02 0.76110E+02 0.76510E+02 0.76910E+02 0.77310E+02 0.77710E+02
 0.78110E+02 0.78510E+02 0.78910E+02 0.79307E+02 0.79705E+02 0.80102E+02 0.80500E+02 0.81200E+02 0.81700E+02 0.82200E+02
 0.82700E+02 0.83200E+02 0.83700E+02 0.84200E+02 0.84700E+02 0.85200E+02 0.85700E+02 0.86200E+02 0.88989E+02 0.91778E+02
 0.94567E+02 0.97356E+02 0.10014E+03 0.10293E+03 0.10572E+03 0.10851E+03 0.11130E+03 0.11397E+03 0.11665E+03 0.11932E+03
 0.12200E+03 0.12475E+03 0.12750E+03 0.13025E+03 0.13300E+03


 RD:  0.0          0.15000E+01 0.30000E+01 0.49000E+01 0.56000E+01 0.76167E+01 0.96333E+01 0.11650E+02 0.13667E+02 0.15683E+02
 0.17700E+02 0.19300E+02 0.20600E+02 0.21900E+02 0.23400E+02 0.24900E+02 0.26400E+02 0.27500E+02 0.30500E+02 0.33500E+02
 0.35605E+02 0.37710E+02 0.38570E+02 0.39430E+02 0.42517E+02 0.45603E+02 0.48690E+02 0.51247E+02 0.53803E+02 0.56360E+02


MAP OF VOLUMETRIC HEAT GEN RATES FOR ALL NODES :
```

R	Z 1	Z 2	Z 3	Z 4	Z 5	Z 6	Z 7	Z 8	Z 9		
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	1.28956D-01	1.05810D-01	8.02682D-02	7.03603D-02
3	0.0	0.0	0.0	0.0	0.0	1.32232D-01	1.08262D-01	8.17790D-02	7.09970D-02
4	0.0	0.0	0.0	0.0	0.0	1.39695D-01	1.19229D-01	9.65085D-02	7.74181D-02
5	0.0	0.0	0.0	0.0	0.0	1.49651D-01	1.27781D-01	1.05536D-01	8.09860D-02
6	0.0	0.0	0.0	0.0	0.0	1.56528D-01	1.22218D-01	9.02069D-02	7.33554D-02
7	0.0	0.0	0.0	0.0	0.0	1.59532D-01	1.20429D-01	8.49410D-02	7.00553D-02
8	0.0	0.0	0.0	0.0	0.0	1.58107D-01	1.19084D-01	8.37654D-02	6.85756D-02
9	0.0	0.0	0.0	0.0	0.0	1.51573D-01	1.14652D-01	8.09997D-02	6.63048D-02
10	0.0	0.0	0.0	0.0	0.0	1.42004D-01	1.08164D-01	7.69177D-02	6.31409D-02
11	0.0	0.0	0.0	0.0	0.0	1.31053D-01	1.01053D-01	7.26062D-02	5.99048D-02
12	0.0	0.0	0.0	0.0	0.0	1.20301D-01	9.43700D-02	6.86442D-02	5.69265D-02
13	0.0	0.0	0.0	0.0	0.0	1.12704D-01	8.93141D-02	6.53879D-02	5.45938D-02
14	0.0	0.0	0.0	0.0	0.0	1.11947D-01	8.75628D-02	6.33963D-02	5.29256D-02
15	0.0	0.0	0.0	0.0	0.0	1.17114D-01	8.95452D-02	6.30655D-02	5.16348D-02
16	0.0	0.0	0.0	0.0	0.0	1.20068D-01	9.11587D-02	6.33881D-02	5.11159D-02
17	0.0	0.0	0.0	0.0	0.0	1.19243D-01	9.08864D-02	6.35029D-02	5.11083D-02
18	0.0	0.0	0.0	0.0	0.0	1.14817D-01	8.80415D-02	6.21860D-02	5.04176D-02
19	0.0	0.0	0.0	0.0	0.0	1.08826D-01	8.40901D-02	6.02636D-02	4.94356D-02
20	0.0	0.0	0.0	0.0	0.0	1.03228D-01	7.91799D-02	5.70182D-02	4.73029D-02
21	0.0	0.0	0.0	0.0	0.0	9.90692D-02	7.51057D-02	5.41003D-02	4.52935D-02

22	0.0	0.0	0.0	0.0	0.0	9.599530-02	7.255340-02	5.224490-02	4.389290-02
23	0.0	0.0	0.0	0.0	0.0	9.315160-02	7.056890-02	5.077540-02	4.266650-02
24	0.0	0.0	0.0	0.0	0.0	8.643450-02	6.588160-02	4.730460-02	3.976960-02
25	0.0	0.0	0.0	0.0	0.0	7.677700-02	5.912790-02	4.246660-02	3.565730-02
26	0.0	0.0	0.0	0.0	8.723610-02	7.329120-02	5.555560-02	4.001980-02	3.352450-02
27	0.0	0.0	0.0	0.0	8.151000-02	6.909400-02	5.197220-02	3.756530-02	3.138500-02
28	0.0	0.0	0.0	0.0	7.198810-02	6.139520-02	4.651960-02	3.358300-02	2.815790-02
29	0.0	0.0	0.0	0.0	6.664230-02	5.520960-02	4.176540-02	3.116980-02	2.635180-02
30	0.0	0.0	0.0	0.0	6.273640-02	5.029270-02	3.800590-02	2.940660-02	2.503220-02
31	0.0	0.0	0.0	0.0	5.527060-02	4.515670-02	3.466760-02	2.676540-02	2.291340-02
32	0.0	0.0	6.221130-02	5.674590-02	5.014460-02	4.099820-02	3.229380-02	2.500940-02	2.141040-02
33	0.0	0.0	5.412490-02	4.885000-02	4.431250-02	3.683090-02	2.991500-02	2.324960-02	1.990420-02
34	0.0	0.0	4.328590-02	3.807080-02	3.549430-02	3.051370-02	2.583060-02	2.063420-02	1.749780-02
35	0.0	0.0	3.806720-02	3.170440-02	2.841160-02	2.556680-02	2.276890-02	1.890890-02	1.579800-02
36	0.0	0.0	3.554770-02	2.817050-02	2.404710-02	2.286030-02	2.129080-02	1.807600-02	1.497740-02
37	0.0	0.0	3.333090-02	2.621890-02	2.215050-02	2.101270-02	1.973360-02	1.710040-02	1.428870-02
38	5.709830-02	5.046520-02	3.712780-02	2.904000-02	2.596600-02	2.472980-02	2.368320-02	2.178510-02	1.835530-02
39	5.096970-02	4.571300-02	3.736800-02	3.130960-02	2.916300-02	2.778680-02	2.691240-02	2.584030-02	2.203250-02
40	4.049170-02	3.719780-02	3.246200-02	2.869180-02	2.729730-02	2.622940-02	2.559150-02	2.516890-02	2.244500-02
41	2.840730-02	2.725470-02	2.639750-02	2.586480-02	2.594050-02	2.556950-02	2.539730-02	2.568720-02	2.407300-02
42 TO 47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

R	Z 10	Z 11	Z 12	Z 13	Z 14	Z 15	Z 16	Z 17	Z 18	
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	7.048420-02	4.276880-01	1.156470-01	7.656460-02	7.057600-02	6.499230-02	6.012810-02	5.631620-02	5.173280-02	
3	7.051790-02	4.304120-01	1.122210-01	7.640710-02	7.033500-02	6.483380-02	5.991050-02	5.610540-02	5.143050-02	
4	7.045610-02	4.336940-01	1.099010-01	8.139950-02	7.547240-02	6.949440-02	6.441700-02	6.055170-02	5.575840-02	
5	7.007310-02	4.352170-01	1.107780-01	8.384620-02	7.785390-02	7.185830-02	6.674730-02	6.280660-02	5.794570-02	
6	6.909480-02	4.380700-01	1.089650-01	7.727960-02	7.126670-02	6.532540-02	6.034490-02	5.645250-02	5.167880-02	
7	6.718580-02	4.410430-01	1.050920-01	7.466230-02	6.863340-02	6.259180-02	5.767590-02	5.386420-02	4.916410-02	
8	6.479940-02	4.372530-01	1.027720-01	7.318340-02	6.718170-02	6.121930-02	5.645090-02	5.267810-02	4.803830-02	
9	6.239560-02	4.260220-01	9.985810-02	7.132340-02	6.541270-02	5.956870-02	5.495680-02	5.129370-02	4.679660-02	
10	5.966970-02	4.091310-01	9.605770-02	6.891850-02	6.320570-02	5.757380-02	5.317730-02	4.965920-02	4.536550-02	
11	5.679260-02	3.892950-01	9.192180-02	6.617000-02	6.073530-02	5.538630-02	5.123210-02	4.789100-02	4.381070-02	
12	5.457480-02	3.701400-01	8.853630-02	6.356330-02	5.843530-02	5.338040-02	4.941150-02	4.621160-02	4.227590-02	
13	5.291590-02	3.536270-01	8.609230-02	6.119020-02	5.638870-02	5.163190-02	4.777000-02	4.466870-02	4.086920-02	
14	5.121510-02	3.397630-01	8.335580-02	5.901410-02	5.446160-02	4.990930-02	4.612420-02	4.319040-02	3.957430-02	
15	4.966680-02	3.256870-01	8.000040-02	5.701200-02	5.249450-02	4.803700-02	4.446100-02	4.161730-02	3.813400-02	
16	4.869830-02	3.129490-01	7.712950-02	5.519910-02	5.081560-02	4.650800-02	4.309600-02	4.031410-02	3.691550-02	
17	4.813710-02	3.038270-01	7.509980-02	5.377510-02	4.957950-02	4.544200-02	4.213200-02	3.944940-02	3.611570-02	
18	4.732010-02	2.947000-01	7.335480-02	5.258730-02	4.848610-02	4.444270-02	4.121670-02	3.862590-02	3.542420-02	
19	4.637240-02	2.852180-01	7.165270-02	5.144500-02	4.740570-02	4.343060-02	4.028490-02	3.778650-02	3.474800-02	
20	4.687940-02	2.742950-01	6.975050-02	4.997380-02	4.618320-02	4.243700-02	3.940900-02	3.697030-02	3.398270-02	
21	4.355760-02	2.654570-01	6.822810-02	4.873950-02	4.520030-02	4.168200-02	3.875640-02	3.635270-02	3.336740-02	
22	4.250580-02	2.590680-01	6.663210-02	4.773550-02	4.429250-02	4.087500-02	3.804820-02	3.569780-02	3.277080-02	
23	4.147100-02	2.532730-01	6.476890-02	4.673140-02	4.330360-02	3.992410-02	3.720780-02	3.492910-02	3.210250-02	
24	3.902690-02	2.395840-01	6.036790-02	4.435960-02	4.096790-02	3.767800-02	3.522260-02	3.311330-02	3.052400-02	
25	3.542960-02	2.165310-01	5.386290-02	4.028430-02	3.711330-02	3.408040-02	3.197180-02	3.010080-02	2.781550-02	
26	3.347670-02	2.020400-01	5.030960-02	3.767570-02	3.473760-02	3.192880-02	2.998360-02	2.823470-02	2.608400-02	
27	3.151370-02	1.875040-01	4.674470-02	3.505890-02	3.235450-02	2.977040-02	2.798910-02	2.636270-02	2.434720-02	
28	2.865800-02	1.628690-01	4.127710-02	3.084610-02	2.853090-02	2.629270-02	2.471320-02	2.328130-02	2.143480-02	
29	2.668340-02	1.472980-01	3.815720-02	2.831330-02	2.624010-02	2.420010-02	2.270370-02	2.138710-02	1.961210-02	
30	2.538680-02	1.359210-01	3.587760-02	2.646260-02	2.456630-02	2.267120-02	2.123540-02	2.000310-02	1.828040-02	
31	2.358650-02	1.180910-01	3.234440-02	2.375150-02	2.201210-02	2.022070-02	1.883000-02	1.764640-02	1.601920-02	
32	2.248370-02	1.057140-01	2.991660-02	2.198930-02	2.028280-02	1.856820-02	1.731130-02	1.611100-02	1.454920-02	
33	2.137870-02	9.331000-02	2.748370-02	2.022350-02	1.854990-02	1.688510-02	0.0	0.0	0.0	
34	1.971440-02	7.569280-02	2.393390-02	1.710510-02	1.563200-02	1.415440-02	1.817940-02	1.634580-02	1.392870-02	
35	1.860200-02	6.461880-02	2.197060-02	1.501640-02	1.374780-02	1.249320-02	1.769250-02	6.924650-02	8.803020-02	
36	1.806490-02	5.927250-02	2.120210-02	0.0	0.0	0.0	1.706550-02	1.106610-01	1.405850-01	

37	1.730180-02	5.369160-02	1.998440-02	1.862230-02	1.766050-02	1.637570-02	1.575410-02	9.595640-02	1.189080-01
38	1.875080-02	4.747850-02	1.856820-02	1.801140-02	8.111950-02	1.033530-01	9.234930-02	1.107860-01	1.071590-01
39	1.986680-02	4.072960-02	1.702990-02	1.715650-02	1.226540-01	1.531750-01	1.349100-01	1.126610-01	6.428630-02
40	2.006670-02	3.349680-02	1.941960-02	1.683070-02	7.770770-02	9.267600-02	8.108340-02	6.986920-02	3.538170-02
41	2.150000-02	1.999410-02	1.866860-02	1.683620-02	1.452740-02	1.220410-02	1.089560-02	9.540080-03	7.710080-03
42 TO 47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

R	Z 19	Z 20	Z 21	Z 22	Z 23	Z 24	Z 25	Z 26	Z 27
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	4.812300-02	4.590020-02	4.337910-02	4.040200-02	3.824000-02	3.715550-02	3.607100-02	3.423360-02	3.234860-02
3	4.772240-02	4.551370-02	4.297690-02	4.003360-02	3.793780-02	3.686540-02	3.579310-02	3.399270-02	3.214440-02
4	5.193040-02	4.967800-02	4.707520-02	4.404900-02	4.189500-02	4.079860-02	3.970220-02	3.787530-02	3.599670-02
5	5.407860-02	5.177930-02	4.912700-02	4.603140-02	4.381950-02	4.270010-02	4.158080-02	3.974420-02	3.786840-02
6	4.789990-02	4.563550-02	4.305650-02	4.008630-02	3.799050-02	3.693260-02	3.587470-02	3.413840-02	3.236560-02
7	4.544090-02	4.323880-02	4.072600-02	3.783730-02	3.580940-02	3.479710-02	3.378490-02	3.210870-02	3.039560-02
8	4.438130-02	4.220290-02	3.975580-02	3.694000-02	3.495130-02	3.395690-02	3.296250-02	3.133420-02	2.967860-02
9	4.324750-02	4.111640-02	3.871740-02	3.595880-02	3.401600-02	3.305170-02	3.208750-02	3.050360-02	2.889370-02
10	4.199700-02	3.996780-02	3.766870-02	3.501530-02	3.314260-02	3.221490-02	3.128720-02	2.975370-02	2.819220-02
11	4.060600-02	3.866780-02	3.649190-02	3.397080-02	3.217550-02	3.127810-02	3.038070-02	2.890540-02	2.740070-02
12	3.917940-02	3.732120-02	3.522780-02	3.279960-02	3.107050-02	3.020750-02	2.934440-02	2.790600-02	2.644160-02
13	3.787570-02	3.606580-02	3.402100-02	3.167290-02	3.001730-02	2.917960-02	2.834180-02	2.695900-02	2.554480-02
14	3.668240-02	3.493850-02	3.296440-02	3.068580-02	2.907820-02	2.828420-02	2.749030-02	2.615840-02	2.478850-02
15	3.538970-02	3.373960-02	3.185960-02	2.966940-02	2.810760-02	2.732970-02	2.655190-02	2.527790-02	2.397650-02
16	3.426640-02	3.267620-02	3.086040-02	2.875840-02	2.726320-02	2.649780-02	2.573240-02	2.449950-02	2.324620-02
17	3.347780-02	3.190120-02	3.014630-02	2.810890-02	2.665730-02	2.594720-02	2.523710-02	2.398530-02	2.270650-02
18	3.287830-02	3.133460-02	2.961070-02	2.760480-02	2.617010-02	2.546070-02	2.475120-02	2.354360-02	2.230700-02
19	3.232890-02	3.082680-02	2.912360-02	2.713760-02	2.571020-02	2.498020-02	2.425020-02	2.311280-02	2.194640-02
20	3.161950-02	3.017710-02	2.852940-02	2.663610-02	2.529580-02	2.459590-02	2.389600-02	2.270140-02	2.144900-02
21	3.102390-02	2.963320-02	2.803920-02	2.624080-02	2.499330-02	2.433300-02	2.367270-02	2.239250-02	2.102340-02
22	3.047920-02	2.912380-02	2.757050-02	2.581340-02	2.459110-02	2.394530-02	2.329950-02	2.198870-02	2.055970-02
23	2.988950-02	2.856430-02	2.704930-02	2.530690-02	2.407230-02	2.342780-02	2.278340-02	2.147100-02	2.007650-02
24	2.849670-02	2.724280-02	2.581840-02	2.411060-02	2.284690-02	2.220560-02	2.156430-02	2.024830-02	1.884320-02
25	2.601570-02	2.486050-02	2.356080-02	2.191240-02	2.060510-02	1.991170-02	1.921840-02	1.788480-02	1.644910-02
26	2.437680-02	2.327120-02	2.203330-02	2.042290-02	1.909130-02	1.842210-02	1.772190-02	1.637220-02	1.500280-02
27	2.273290-02	2.167680-02	2.050110-02	1.892880-02	1.757280-02	1.688400-02	0.0	0.0	0.0
28	1.985840-02	1.878230-02	1.761590-02	1.610280-02	1.481990-02	1.415820-02	1.939780-02	1.744390-02	1.509730-02
29	1.806580-02	1.701720-02	1.580510-02	1.432300-02	1.314310-02	1.256150-02	1.880050-02	7.913830-02	1.043190-01
30	1.675800-02	0.0	0.0	0.0	0.0	0.0	1.720370-02	1.179310-01	1.553440-01
31	1.458320-02	1.887910-02	1.721540-02	1.503440-02	1.359630-02	1.300790-02	1.392660-02	8.505570-02	1.079650-01
32	1.323910-02	1.828840-02	7.987920-02	1.067560-01	9.253370-02	8.640320-02	8.027260-02	9.307500-02	8.950650-02
33	0.0	1.670930-02	1.169710-01	1.528500-01	1.253940-01	1.166510-01	1.079090-01	8.745100-02	6.996760-02
34	1.251890-02	1.342720-02	8.108110-02	9.954290-02	7.682700-02	7.138300-02	6.593900-02	5.746570-02	5.121830-02
35	7.550400-02	7.024360-02	8.526360-02	8.302840-02	6.648760-02	6.198700-02	5.748640-02	5.126920-02	4.706080-02
36	1.178590-01	1.105870-01	9.284840-02	7.537860-02	8.859740-03	8.539760-03	7.899780-03	7.138520-03	6.609520-03
37	9.831410-02	9.305500-02	8.090520-02	6.854910-02	8.504480-03	8.212650-03	7.629000-03	6.961790-03	6.495050-03
38	8.937450-02	8.426750-02	7.519100-02	6.557350-02	8.247250-03	6.790870-03	5.232890-03	4.870070-03	4.590690-03
39	1.129240-02	1.052350-02	9.898580-03	8.970380-03	8.090410-03	5.391150-03	2.869780-03	2.753060-03	2.640740-03
40	1.003890-02	9.340160-03	8.808290-03	8.053710-03	7.345060-03	5.599990-03	4.003470-03	3.796480-03	3.587350-03
41	6.472210-03	6.006510-03	5.645350-03	5.148610-03	4.690760-03	4.459970-03	4.229180-03	3.963490-03	3.704290-03
42 TO 47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

R	Z 28	Z 29	Z 30	Z 31	Z 32	Z 33	Z 34	Z 35	Z 36
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3.116910-02	3.033420-02	2.929050-02	2.783930-02	2.658320-02	2.590390-02	2.522460-02	2.406500-02	2.236160-02
3	3.098260-02	3.015220-02	2.910270-02	2.762830-02	2.634540-02	2.566060-02	2.497580-02	2.385920-02	2.219080-02
4	3.480960-02	3.395360-02	3.286130-02	3.129730-02	2.992130-02	2.919910-02	2.847690-02	2.729620-02	2.556290-02
5	3.668840-02	3.582850-02	3.471880-02	3.315060-02	3.177610-02	3.103410-02	3.029220-02	2.908100-02	2.731570-02
6	3.125120-02	3.044680-02	2.941930-02	2.797410-02	2.671220-02	2.603090-02	2.534970-02	2.424970-02	2.261360-02

7	2.93206D-02	2.85492D-02	2.75702D-02	2.61803D-02	2.49629D-02	2.43180D-02	2.36732D-02	2.26323D-02	2.10747D-02
8	2.86435D-02	2.79021D-02	2.69629D-02	2.56345D-02	2.44730D-02	2.38546D-02	2.32362D-02	2.22356D-02	2.07250D-02
9	2.78891D-02	2.71700D-02	2.62599D-02	2.49714D-02	2.38448D-02	2.32468D-02	2.26488D-02	2.16791D-02	2.02089D-02
10	2.72174D-02	2.65180D-02	2.56308D-02	2.43740D-02	2.32734D-02	2.26864D-02	2.20993D-02	2.11496D-02	1.97147D-02
11	2.64569D-02	2.57795D-02	2.49193D-02	2.36999D-02	2.26320D-02	2.20641D-02	2.14961D-02	2.05771D-02	1.91906D-02
12	2.55306D-02	2.48764D-02	2.40454D-02	2.28705D-02	2.18447D-02	2.13011D-02	2.07575D-02	1.98805D-02	1.85513D-02
13	2.46554D-02	2.40219D-02	2.32245D-02	2.20939D-02	2.11039D-02	2.05775D-02	2.00511D-02	1.92020D-02	1.79180D-02
14	2.39247D-02	2.33046D-02	2.25173D-02	2.14161D-02	2.04612D-02	1.99516D-02	1.94416D-02	1.86195D-02	1.73744D-02
15	2.31571D-02	2.25636D-02	2.18024D-02	2.07197D-02	1.97728D-02	1.92784D-02	1.87840D-02	1.79913D-02	1.67869D-02
16	2.24576D-02	2.18885D-02	2.11617D-02	2.01158D-02	1.91913D-02	1.87045D-02	1.82177D-02	1.74415D-02	1.62613D-02
17	2.19234D-02	2.13637D-02	2.06564D-02	1.96739D-02	1.88183D-02	1.83415D-02	1.78647D-02	1.70842D-02	1.58992D-02
18	2.15369D-02	2.09805D-02	2.02693D-02	1.92538D-02	1.83556D-02	1.78687D-02	1.73817D-02	1.65939D-02	1.54357D-02
19	2.11926D-02	2.06374D-02	1.99131D-02	1.88260D-02	1.78404D-02	1.73350D-02	1.68297D-02	1.60330D-02	1.49151D-02
20	2.06416D-02	2.00697D-02	1.93544D-02	1.82619D-02	1.72263D-02	1.66639D-02	1.61004D-02	1.51411D-02	1.39043D-02
21	2.01520D-02	1.95615D-02	1.88603D-02	1.77854D-02	1.67236D-02	1.61226D-02	0.0	0.0	0.0
22	1.96367D-02	1.90185D-02	1.82951D-02	1.71972D-02	1.61162D-02	1.54958D-02	2.46556D-02	2.29522D-02	2.07814D-02
23	1.91637D-02	1.85163D-02	1.77556D-02	1.66181D-02	1.55229D-02	1.49194D-02	2.39014D-02	1.16106D-01	1.63732D-01
24	0.0	0.0	0.0	0.0	0.0	0.0	2.11337D-02	1.61012D-01	2.22321D-01
25	2.27166D-02	2.17925D-02	2.00455D-02	1.76073D-02	1.56129D-02	1.48258D-02	1.61776D-02	9.97890D-02	1.26319D-01
26	2.21319D-02	2.11887D-02	1.27877D-01	1.28399D-01	1.09464D-01	1.01541D-01	9.36186D-02	1.07764D-01	1.03654D-01
27	1.99864D-02	1.89733D-02	1.90952D-01	1.83000D-01	1.47402D-01	1.35394D-01	1.23385D-01	9.85072D-02	7.88678D-02
28	1.56078D-02	1.46909D-02	1.26738D-01	1.14379D-01	8.67922D-02	7.94377D-02	7.20832D-02	6.13665D-02	5.40163D-02
29	9.00474D-02	7.92897D-02	1.09577D-01	9.45562D-02	7.52920D-02	7.01008D-02	6.49095D-02	5.69160D-02	5.11483D-02
30	1.29598D-01	1.13094D-01	9.48822D-02	7.91407D-02	9.95926D-03	9.66590D-03	9.07164D-03	8.16069D-03	7.29345D-03
31	8.79194D-02	7.71539D-02	6.85132D-02	6.13160D-02	8.46350D-03	8.28868D-03	7.93455D-03	7.35807D-03	6.75977D-03
32	7.62993D-02	6.83891D-02	6.19540D-02	5.66325D-02	7.79350D-03	6.53057D-03	5.22737D-03	4.98479D-03	4.70599D-03
33	0.0	8.74821D-03	8.25796D-03	7.53664D-03	7.11753D-03	4.97711D-03	2.86887D-03	2.84600D-03	2.79023D-03
34	0.0	7.18372D-03	6.91569D-03	6.51104D-03	6.27068D-03	4.45494D-03	2.66905D-03	2.67932D-03	2.65633D-03
35	0.0	6.60027D-03	4.89322D-03	4.29508D-03	4.15804D-03	3.33525D-03	2.51643D-03	2.53142D-03	2.52551D-03
36	6.44502D-03	6.32329D-03	3.24561D-03	2.45504D-03	2.43146D-03	2.43711D-03	2.44275D-03	2.46002D-03	2.46235D-03
37	6.33647D-03	6.20166D-03	3.14912D-03	2.37755D-03	2.35358D-03	2.35578D-03	2.35797D-03	2.37255D-03	2.37273D-03
38	4.46110D-03	4.37211D-03	2.82837D-03	2.41568D-03	2.38106D-03	2.37690D-03	2.37273D-03	2.38072D-03	2.36694D-03
39	2.56475D-03	2.52598D-03	2.49865D-03	2.44948D-03	2.40405D-03	2.39133D-03	2.37861D-03	2.38023D-03	2.35035D-03
40	3.44098D-03	3.35582D-03	3.27529D-03	3.14216D-03	3.01985D-03	2.97231D-03	2.92477D-03	2.89356D-03	2.81602D-03
41	3.52452D-03	3.41741D-03	3.31186D-03	3.12843D-03	2.95652D-03	2.89372D-03	2.83092D-03	2.81467D-03	2.74202D-03
42 TO 47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

R	Z 37	Z 38	Z 39	Z 40	Z 41	Z 42	Z 43	Z 44	Z 45		
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
2	2.03655D-02	1.85462D-02	3.22063D-02	2.35084D-01	2.30801D-01	1.59497D-01	1.28919D-01	1.01819D-01	7.93589D-02		
3	2.01951D-02	1.83802D-02	3.18359D-02	2.32132D-01	2.27822D-01	1.57247D-01	1.27333D-01	1.00834D-01	7.86722D-02		
4	2.35019D-02	2.15278D-02	3.11210D-02	2.27059D-01	2.22994D-01	1.53988D-01	1.24937D-01	9.91975D-02	7.74733D-02		
5	2.52199D-02	2.31633D-02	3.04112D-02	2.22268D-01	2.17863D-01	1.50481D-01	1.22210D-01	9.71674D-02	7.59973D-02		
6	2.06541D-02	1.88359D-02	3.02955D-02	2.22080D-01	2.16136D-01	1.48593D-01	1.20524D-01	9.56942D-02	7.47032D-02		
7	1.92030D-02	1.74799D-02	3.05462D-02	2.24894D-01	2.17637D-01	1.48826D-01	1.20306D-01	9.50973D-02	7.38489D-02		
8	1.88983D-02	1.72075D-02	3.02849D-02	2.23342D-01	2.15419D-01	1.46717D-01	1.18250D-01	9.31078D-02	7.20286D-02		
9	1.84251D-02	1.67680D-02	2.94553D-02	2.16782D-01	2.07929D-01	1.40822D-01	1.13329D-01	8.91016D-02	6.88814D-02		
10	1.79771D-02	1.63614D-02	2.87813D-02	2.11019D-01	2.02147D-01	1.36579D-01	1.09804D-01	8.62344D-02	6.66588D-02		
11	1.75132D-02	1.59510D-02	2.81596D-02	2.05638D-01	1.97542D-01	1.33726D-01	1.07636D-01	8.46570D-02	6.55070D-02		
12	1.69364D-02	1.54271D-02	2.71595D-02	1.97816D-01	1.90087D-01	1.28810D-01	1.03835D-01	8.18411D-02	6.34686D-02		
13	1.63610D-02	1.49077D-02	2.60952D-02	1.89748D-01	1.82309D-01	1.23320D-01	9.93052D-02	7.81755D-02	6.06231D-02		
14	1.58621D-02	1.44481D-02	2.50723D-02	1.81967D-01	1.74443D-01	1.17744D-01	9.47675D-02	7.45564D-02	5.77119D-02		
15	1.53180D-02	1.39353D-02	2.38595D-02	1.72854D-01	1.65074D-01	1.11176D-01	8.95266D-02	7.05081D-02	5.46592D-02		
16	1.48208D-02	1.34710D-02	2.29076D-02	1.65699D-01	1.57987D-01	1.06185D-01	8.55151D-02	6.73834D-02	5.23237D-02		
17	1.44631D-02	1.31329D-02	2.23591D-02	1.61538D-01	1.53992D-01	1.03437D-01	8.32943D-02	6.56109D-02	5.08079D-02		
18	1.40588D-02	1.27694D-02	2.19721D-02	1.57184D-01	1.50440D-01	1.00779D-01	8.10690D-02	6.37963D-02	4.94650D-02		
19	1.36208D-02	1.23819D-02	2.16326D-02	1.52588D-01	1.46924D-01	9.80525D-02	7.87560D-02	6.18953D-02	4.81372D-02		
20	1.25935D-02	1.14515D-02	1.99166D-02	1.36557D-01	1.35531D-01	9.18165D-02	7.70407D-02	6.32557D-02	5.21521D-02		
21	0.0	0.0	1.81527D-02	1.20546D-01	1.24233D-01	8.58937D-02	7.78663D-02	1.00929D-02	9.18144D-03		

22	1.89212D-02	1.73717D-02	1.64424D-02	1.07368D-01	1.13556D-01	8.05918D-02	7.43020D-02	9.83428D-03	9.06437D-03
23	1.43481D-01	1.25655D-01	1.10206D-01	1.24133D-01	1.04856D-01	7.61452D-02	7.07961D-02	9.35562D-03	6.80770D-03
24	1.83172D-01	1.55634D-01	1.33667D-01	1.02200D-01	7.70791D-02	9.42883D-03	8.92190D-03	8.29225D-03	4.57418D-03
25	9.47319D-02	7.71734D-02	6.47702D-02	5.48341D-02	4.88625D-02	7.27549D-03	7.12426D-03	6.92735D-03	4.17695D-03
26	8.11186D-02	6.82122D-02	5.89460D-02	5.09894D-02	4.60515D-02	6.66967D-03	5.50388D-03	4.71795D-03	3.50857D-03
27	9.90008D-03	9.05283D-03	8.13395D-03	7.28102D-03	6.48579D-03	6.07486D-03	4.14249D-03	2.91166D-03	2.94855D-03
28	7.67571D-03	7.24068D-03	6.76625D-03	6.27873D-03	5.78800D-03	5.49539D-03	3.83583D-03	2.78256D-03	2.80136D-03
29	7.05998D-03	6.68678D-03	6.28308D-03	4.97186D-03	4.16514D-03	4.04421D-03	3.22974D-03	2.70516D-03	2.69815D-03
30	6.70031D-03	6.28206D-03	5.93005D-03	3.86805D-03	2.71191D-03	2.69201D-03	2.67050D-03	2.64861D-03	2.62274D-03
31	6.28219D-03	5.90680D-03	5.61049D-03	3.71064D-03	2.62998D-03	2.60597D-03	2.56978D-03	2.53224D-03	2.48693D-03
32	4.45377D-03	4.24639D-03	4.08003D-03	3.11301D-03	2.54992D-03	2.51677D-03	2.47603D-03	2.43386D-03	2.38147D-03
33	2.71094D-03	2.63792D-03	2.57733D-03	2.52478D-03	2.46969D-03	2.42739D-03	2.38208D-03	2.33528D-03	2.27579D-03
34	2.59965D-03	2.53938D-03	2.48664D-03	2.41818D-03	2.33321D-03	2.26456D-03	2.21202D-03	2.15987D-03	2.09945D-03
35	2.49309D-03	2.45259D-03	2.41473D-03	2.34023D-03	2.23163D-03	2.13709D-03	2.07948D-03	2.02484D-03	1.97024D-03
36	2.44164D-03	2.41069D-03	2.38002D-03	2.30260D-03	2.18260D-03	2.07555D-03	2.01550D-03	1.95965D-03	1.90785D-03
37	2.35051D-03	2.32190D-03	2.29424D-03	2.22631D-03	2.11697D-03	2.01571D-03	1.95422D-03	1.89677D-03	1.84464D-03
38	2.32509D-03	2.29018D-03	2.26084D-03	2.21633D-03	2.13887D-03	2.05798D-03	1.99060D-03	1.92591D-03	1.86653D-03
39	2.28333D-03	2.23942D-03	2.20692D-03	2.19076D-03	2.15350D-03	2.09939D-03	2.02519D-03	1.95166D-03	1.88160D-03
40	2.68824D-03	2.60452D-03	2.54312D-03	2.52262D-03	2.48645D-03	2.43010D-03	2.33426D-03	2.23735D-03	2.13753D-03
41	2.59428D-03	2.50734D-03	2.44746D-03	2.45401D-03	2.45173D-03	2.41527D-03	2.31254D-03	2.20648D-03	2.09197D-03
42 TO 47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

R	Z 46	Z 47	Z 48	Z 49	Z 50	Z 51	Z 52	Z 53	Z 54		
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
2	5.53392D-02	3.81486D-02	2.89946D-02	2.32506D-02	1.75607D-02	1.38007D-02	1.15487D-02	7.85644D-03	1.86555D-03		
3	5.50214D-02	3.80865D-02	2.90035D-02	2.33088D-02	1.76589D-02	1.39152D-02	1.16584D-02	7.93006D-03	1.86632D-03		
4	5.43579D-02	3.78021D-02	2.88463D-02	2.32329D-02	1.76346D-02	1.38993D-02	1.16491D-02	7.92752D-03	1.85632D-03		
5	5.33987D-02	3.71551D-02	2.83652D-02	2.28429D-02	1.73578D-02	1.37167D-02	1.15092D-02	7.85137D-03	1.83444D-03		
6	5.23385D-02	3.63203D-02	2.76774D-02	2.22633D-02	1.68892D-02	1.33265D-02	1.11868D-02	7.66239D-03	1.80285D-03		
7	5.13727D-02	3.54174D-02	2.68333D-02	2.15207D-02	1.62513D-02	1.27629D-02	1.07104D-02	7.37173D-03	1.75599D-03		
8	4.98441D-02	3.42165D-02	2.58504D-02	2.06989D-02	1.56024D-02	1.22402D-02	1.02762D-02	7.10824D-03	1.70514D-03		
9	4.76459D-02	3.27318D-02	2.47621D-02	1.98487D-02	1.49886D-02	1.17856D-02	9.92830D-03	6.91333D-03	1.66059D-03		
10	4.61153D-02	3.16936D-02	2.39903D-02	1.92521D-02	1.45553D-02	1.14513D-02	9.65867D-03	6.75680D-03	1.61834D-03		
11	4.53865D-02	3.12209D-02	2.36263D-02	1.89469D-02	1.43118D-02	1.12530D-02	9.49101D-03	6.66071D-03	1.57645D-03		
12	4.41073D-02	3.04227D-02	2.30730D-02	1.85216D-02	1.40009D-02	1.10101D-02	9.29669D-03	6.55726D-03	1.53154D-03		
13	4.21554D-02	2.91039D-02	2.20799D-02	1.77326D-02	1.34149D-02	1.05617D-02	8.95000D-03	6.37048D-03	1.48318D-03		
14	4.00087D-02	2.75542D-02	2.08923D-02	1.67978D-02	1.27285D-02	1.00366D-02	8.52807D-03	6.13525D-03	1.43521D-03		
15	3.79946D-02	2.62385D-02	1.99223D-02	1.60299D-02	1.21763D-02	9.64765D-03	8.27512D-03	6.06118D-03	1.41209D-03		
16	3.65052D-02	2.53246D-02	1.92935D-02	1.56216D-02	1.23950D-02	1.04745D-02	9.81282D-03	7.08932D-03	1.47693D-03		
17	3.53160D-02	2.45339D-02	1.88509D-02	1.55292D-02	1.34121D-02	2.31763D-03	2.24785D-03	1.75581D-03	1.59435D-03		
18	3.45587D-02	2.51081D-02	2.04992D-02	1.79766D-02	1.64251D-02	2.65738D-03	2.47506D-03	1.99271D-03	1.72347D-03		
19	3.39396D-02	2.65939D-02	3.95415D-03	3.73782D-03	3.40574D-03	3.13760D-03	2.34762D-03	1.81148D-03	1.86212D-03		
20	3.96988D-02	3.25057D-02	4.59382D-03	4.03948D-03	3.62807D-03	3.42796D-03	2.62665D-03	2.06258D-03	2.02113D-03		
21	7.57329D-03	6.17905D-03	5.36193D-03	3.23762D-03	2.45100D-03	2.41337D-03	2.50704D-03	2.26979D-03	2.14957D-03		
22	7.66449D-03	6.39118D-03	5.67028D-03	3.42334D-03	2.57166D-03	2.52413D-03	2.61867D-03	2.38599D-03	2.22095D-03		
23	5.29654D-03	4.65900D-03	4.28520D-03	3.11166D-03	2.63867D-03	2.58130D-03	2.68269D-03	2.46316D-03	2.26766D-03		
24	3.11935D-03	3.02939D-03	2.94717D-03	2.88226D-03	2.79694D-03	2.71632D-03	2.83392D-03	2.64543D-03	2.37799D-03		
25	3.12979D-03	3.10438D-03	3.04367D-03	2.97026D-03	2.86754D-03	2.76934D-03	2.90043D-03	2.75109D-03	2.42819D-03		
26	3.04780D-03	3.01959D-03	2.96599D-03	2.89618D-03	2.79647D-03	2.69993D-03	2.83138D-03	2.69890D-03	2.37986D-03		
27	2.96555D-03	2.93453D-03	2.88807D-03	2.82186D-03	2.72518D-03	2.63030D-03	2.76211D-03	2.64654D-03	2.33138D-03		
28	2.78914D-03	2.73601D-03	2.68452D-03	2.61991D-03	2.52845D-03	2.44054D-03	2.57116D-03	2.48372D-03	2.18677D-03		
29	2.65594D-03	2.57867D-03	2.51398D-03	2.44772D-03	2.35964D-03	2.27856D-03	2.40736D-03	2.33741D-03	2.05877D-03		
30	2.55862D-03	2.46371D-03	2.38937D-03	2.32192D-03	2.23629D-03	2.16021D-03	2.28769D-03	2.23050D-03	1.96525D-03		
31	2.40611D-03	2.30195D-03	2.22154D-03	2.15036D-03	2.06310D-03	1.98838D-03	2.11065D-03	2.07142D-03	1.82848D-03		
32	2.30025D-03	2.20133D-03	2.12245D-03	2.04750D-03	1.95565D-03	1.87776D-03	1.99443D-03	1.96635D-03	1.73974D-03		
33	2.19416D-03	2.10050D-03	2.02315D-03	1.94443D-03	1.84796D-03	1.76690D-03	1.87796D-03	1.86106D-03	1.65082D-03		
34	2.02163D-03	1.94133D-03	1.87758D-03	1.80288D-03	1.70622D-03	1.62171D-03	1.72599D-03	1.72482D-03	1.51934D-03		
35	1.89788D-03	1.83010D-03	1.78289D-03	1.71729D-03	1.62497D-03	1.53903D-03	1.63987D-03	1.64850D-03	1.43307D-03		
36	1.83813D-03	1.77641D-03	1.73718D-03	1.67597D-03	1.58575D-03	1.49912D-03	1.59830D-03	1.61165D-03	1.39142D-03		

37	1.778760-03	1.726550-03	1.696330-03	1.643540-03	1.554380-03	1.461800-03	1.559090-03	1.582710-03	1.367970-03
38	1.803890-03	1.766210-03	1.747870-03	1.707860-03	1.617220-03	1.510680-03	1.543660-03	1.559590-03	1.361000-03
39	1.820540-03	1.798780-03	1.794070-03	1.769740-03	1.679120-03	1.558320-03	1.525480-03	1.534470-03	1.353420-03
40	2.050090-03	2.016530-03	2.008370-03	1.987910-03	1.907690-03	1.798420-03	1.764240-03	1.688100-03	1.475950-03
41	1.999880-03	1.978960-03	1.985740-03	1.985240-03	1.947490-03	1.885810-03	1.821370-03	1.847270-03	2.110140-03
42	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.405150-03	5.631480-03
43	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.942120-03	1.121200-02
44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.093470-03	1.524270-02
45 TO 47	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

R	Z 55	Z 56	Z 57	Z 58	Z 59	Z 60	Z 61	Z 62	Z 63
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	1.961550-03	1.670670-03	8.465500-04	4.629370-04	2.792400-04	1.863780-04	1.347560-04	1.048990-04	8.618480-05
3	1.958220-03	1.663720-03	8.418080-04	4.673240-04	2.786250-04	1.864330-04	1.349670-04	1.049390-04	8.577270-05
4	1.953940-03	1.676000-03	8.711560-04	5.083900-04	3.218940-04	2.289430-04	1.752010-04	1.424030-04	1.197370-04
5	1.938510-03	1.671850-03	8.840670-04	5.313600-04	3.475460-04	2.547480-04	2.013280-04	1.677800-04	1.424220-04
6	1.902120-03	1.424360-03	8.287100-04	4.725690-04	2.908130-04	2.024190-04	1.531960-04	1.233210-04	1.011660-04
7	1.857570-03	1.387560-03	8.006510-04	4.499530-04	2.724960-04	1.875130-04	1.389120-04	1.092000-04	8.803630-05
8	1.808820-03	1.352580-03	7.818220-04	4.419860-04	2.704880-04	1.885070-04	1.402110-04	1.098210-04	8.886570-05
9	1.763250-03	1.318400-03	7.628290-04	4.323350-04	2.664770-04	1.873120-04	1.392780-04	1.087740-04	8.796180-05
10	1.717270-03	1.284100-03	7.445660-04	4.237440-04	2.620890-04	1.828380-04	1.345240-04	1.054610-04	8.662120-05
11	1.667820-03	1.246120-03	7.245630-04	4.140400-04	2.552910-04	1.765820-04	1.309820-04	1.058740-04	9.050430-05
12	1.615910-03	1.206780-03	7.023670-04	4.009000-04	2.480390-04	1.757730-04	1.360830-04	1.136610-04	9.854330-05
13	1.566560-03	1.169170-03	6.817710-04	3.921140-04	2.488970-04	1.830280-04	1.453360-04	1.216260-04	1.038700-04
14	1.517360-03	1.135440-03	6.674900-04	3.937110-04	2.577860-04	1.910570-04	1.503240-04	1.239400-04	1.045200-04
15	1.487670-03	1.108620-03	6.584270-04	3.977870-04	2.636630-04	1.942070-04	1.507090-04	1.227360-04	1.027760-04
16	1.490530-03	1.089420-03	6.496490-04	3.954470-04	2.626250-04	1.930730-04	1.493280-04	1.211340-04	1.007720-04
17	1.509590-03	1.076670-03	6.405750-04	3.897070-04	2.597330-04	1.903920-04	1.478240-04	1.199570-04	9.917210-05
18	1.540460-03	1.060740-03	6.303000-04	3.835050-04	2.559660-04	1.874330-04	1.457260-04	1.180530-04	9.759260-05
19	1.577100-03	1.046590-03	6.191720-04	3.768850-04	2.517160-04	1.842540-04	1.433170-04	1.158020-04	9.595980-05
20	1.620390-03	1.034520-03	6.110830-04	3.725460-04	2.488250-04	1.812990-04	1.403300-04	1.130930-04	9.380900-05
21	1.655730-03	1.025970-03	6.058820-04	3.699660-04	2.470550-04	1.791090-04	1.378520-04	1.108490-04	9.199240-05
22	1.678230-03	1.023290-03	6.064650-04	3.715100-04	2.480220-04	1.791140-04	1.372260-04	1.099610-04	9.104880-05
23	1.696070-03	1.029290-03	6.105850-04	3.757710-04	2.507840-04	1.804520-04	1.376360-04	1.097260-04	9.050340-05
24	1.738220-03	1.038750-03	6.205650-04	3.858350-04	2.573090-04	1.836120-04	1.386050-04	1.091710-04	8.921520-05
25	1.745900-03	1.036570-03	6.333260-04	4.051030-04	2.742670-04	1.957250-04	1.461330-04	1.132870-04	9.111280-05
26	1.713430-03	1.026530-03	6.396030-04	4.185770-04	2.884400-04	2.073360-04	1.543370-04	1.188490-04	9.470120-05
27	1.680860-03	1.012650-03	6.455000-04	4.320930-04	3.026570-04	2.189840-04	1.625670-04	1.244280-04	9.830080-05
28	1.585080-03	9.683530-04	6.365000-04	4.435400-04	3.226690-04	2.404580-04	1.818650-04	1.399990-04	1.100740-04
29	1.500780-03	9.266350-04	6.194870-04	4.440620-04	3.329270-04	2.550470-04	1.971980-04	1.534240-04	1.208390-04
30	1.439180-03	8.961530-04	6.070560-04	4.444440-04	3.404220-04	2.657070-04	2.084010-04	1.632330-04	1.287050-04
31	1.356400-03	8.615840-04	5.894210-04	4.342140-04	3.396590-04	2.729690-04	2.204640-04	1.769160-04	1.416660-04
32	1.307670-03	8.459600-04	5.783520-04	4.202460-04	3.311940-04	2.720190-04	2.253530-04	1.853440-04	1.510650-04
33	1.258830-03	8.303030-04	5.672590-04	4.042460-04	3.227110-04	2.710680-04	2.302530-04	1.937890-04	1.604850-04
34	1.192080-03	8.332860-04	5.729270-04	3.914330-04	3.046990-04	2.605980-04	2.293400-04	2.007470-04	1.719910-04
35	1.151950-03	8.528200-04	5.914910-04	3.856750-04	2.892010-04	2.476320-04	2.232540-04	2.015940-04	1.779130-04
36	1.132580-03	8.622510-04	6.004530-04	3.828950-04	2.817190-04	2.413730-04	2.203160-04	2.020030-04	1.807720-04
37	1.121710-03	8.659950-04	6.137590-04	3.893180-04	2.783700-04	2.351080-04	2.147850-04	1.993610-04	1.812230-04
38	1.118550-03	8.643290-04	6.323510-04	4.053830-04	2.789070-04	2.283910-04	2.062730-04	1.934850-04	1.793040-04
39	1.115120-03	8.625200-04	6.525460-04	4.228340-04	2.794910-04	2.210950-04	1.970270-04	1.871010-04	1.772190-04
40	1.170360-03	8.937780-04	6.713860-04	4.363110-04	2.846170-04	2.195710-04	1.923890-04	1.820610-04	1.732770-04
41	1.456280-03	1.055340-03	7.295060-04	4.723390-04	3.094910-04	2.253170-04	1.859650-04	1.683210-04	1.571720-04
42	2.777980-03	1.566200-03	9.005630-04	5.742720-04	3.757570-04	2.573870-04	1.921400-04	1.569860-04	1.357250-04
43	4.707180-03	2.382240-03	1.211040-03	7.039210-04	4.574860-04	3.260680-04	2.317640-04	1.741110-04	1.395030-04
44	7.058650-03	2.962020-03	1.417310-03	8.454800-04	5.850780-04	4.127960-04	2.932520-04	2.110510-04	1.865240-04
45	9.514240-03	4.667020-03	2.146320-03	1.234900-03	7.381360-04	5.043090-04	6.121650-04	3.036660-04	2.462440-04
46	0.0	0.0	0.0	2.424520-03	1.681500-03	8.786050-04	6.288930-04	4.187040-04	2.921040-04
47	0.0	0.0	0.0	0.0	0.0	0.0	8.009640-04	4.636070-04	3.146060-04

R	Z 64	Z 65	Z 66	Z 67	Z 68	Z 69	Z 70	Z 71		
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	7.312980-05	6.132500-05	5.024980-05	4.326460-05	4.003090-05	3.559790-05	3.834260-05	3.957720-05	
3	7.253860-05	6.085160-05	5.066230-05	4.378410-05	3.912910-05	3.420070-05	3.828970-05	4.114010-05	
4	1.025500-04	8.712400-05	7.402590-05	6.404270-05	5.585090-05	4.861480-05	4.527590-05	4.257510-05	
5	1.213080-04	1.030620-04	8.843670-05	7.598820-05	6.580960-05	5.790030-05	4.968480-05	4.264330-05	
6	8.418480-05	7.141090-05	7.616180-05	7.729220-05	5.569130-05	3.909930-05	4.098430-05	4.207380-05	
7	7.365470-05	6.320200-05	7.369190-05	7.761530-05	5.185530-05	3.271120-05	3.877230-05	4.359990-05	
8	7.464760-05	6.335790-05	7.351410-05	7.779240-05	5.294380-05	3.465070-05	4.244240-05	4.853870-05	
9	7.348940-05	6.271280-05	7.529880-05	8.278690-05	5.848600-05	3.922660-05	4.763060-05	5.386660-05	
10	7.465010-05	6.659440-05	8.286310-05	9.245080-05	6.532880-05	4.321330-05	5.120690-05	5.691040-05	
11	8.093860-05	7.363790-05	9.109880-05	1.001070-04	6.924320-05	4.479480-05	5.216100-05	5.731740-05	
12	8.749240-05	7.790450-05	9.426840-05	1.019910-04	6.962660-05	4.445150-05	5.104710-05	5.554520-05	
13	9.004580-05	7.844610-05	9.327150-05	9.993820-05	6.770280-05	4.290410-05	4.917760-05	5.342420-05	
14	8.983510-05	7.756180-05	9.115070-05	9.659030-05	6.482980-05	4.090300-05	4.698350-05	5.118810-05	
15	8.806510-05	7.575850-05	8.853140-05	9.308860-05	6.193860-05	3.881670-05	4.445790-05	4.831200-05	
16	8.564860-05	7.346370-05	8.585840-05	9.010220-05	5.969130-05	3.723100-05	4.265650-05	4.637930-05	
17	8.373310-05	7.142420-05	8.375000-05	8.781280-05	5.806670-05	3.630330-05	4.171890-05	4.555550-05	
18	8.210380-05	6.978480-05	8.161550-05	8.558990-05	5.673330-05	3.569630-05	4.119370-05	4.500050-05	
19	8.052230-05	6.823710-05	7.938830-05	8.330700-05	5.546130-05	3.519020-05	4.080810-05	4.452830-05	
20	7.887510-05	6.682600-05	7.769520-05	8.153160-05	5.445710-05	3.468300-05	4.031000-05	4.422070-05	
21	7.759200-05	6.578980-05	7.657260-05	8.033730-05	5.377540-05	3.429420-05	3.989180-05	4.403890-05	
22	7.683420-05	6.523700-05	7.608650-05	7.988350-05	5.349260-05	3.410850-05	3.962700-05	4.381740-05	
23	7.628950-05	6.490050-05	7.591880-05	7.981570-05	5.341240-05	4.001920-05	4.490250-05	4.354110-05	
24	7.500300-05	6.410570-05	7.552260-05	7.965570-05	5.322290-05	4.553920-05	4.961150-05	4.288850-05	
25	7.578460-05	6.454650-05	7.601850-05	8.018430-05	5.352320-05	4.535760-05	4.902910-05	4.248150-05	
26	7.801270-05	6.587180-05	7.701530-05	8.098650-05	5.407670-05	4.560270-05	4.979990-05	4.262600-05	
27	8.024770-05	6.720120-05	7.801520-05	8.179120-05	5.463190-05	4.584860-05	5.125400-05	0.0	
28	8.868750-05	7.301890-05	8.286920-05	8.569900-05	5.656260-05	4.666090-05	5.190530-05	0.0	
29	9.674740-05	7.878440-05	8.778810-05	8.965930-05	6.542540-05	5.379700-05	5.267730-05	0.0	
30	1.026370-04	8.299700-05	9.138220-05	9.255300-05	7.390010-05	6.075580-05	5.324140-05	0.0	
31	1.138950-04	9.209420-05	1.001680-04	1.002000-04	7.845520-05	6.340480-05	5.547550-05	0.0	
32	1.229980-04	9.999230-05	1.082680-04	1.074820-04	8.305350-05	6.733960-05	5.758150-05	0.0	
33	1.321210-04	1.079070-04	1.163840-04	1.147800-04	8.766150-05	7.285080-05	0.0	0.0	
34	1.451730-04	1.203450-04	1.298730-04	1.278770-04	9.717910-05	8.043930-05	0.0	0.0	
35	1.534400-04	1.290000-04	1.397240-04	1.380230-04	1.071790-04	8.651780-05	0.0	0.0	
36	1.574320-04	1.331790-04	1.444800-04	1.429210-04	1.160730-04	0.0	0.0	0.0	
37	1.597540-04	1.364580-04	1.490020-04	1.479250-04	1.206050-04	0.0	0.0	0.0	
38	1.605740-04	1.390720-04	1.536150-04	1.533930-04	1.259110-04	0.0	0.0	0.0	
39	1.614640-04	1.419120-04	1.586250-04	1.593320-04	1.316730-04	0.0	0.0	0.0	
40	1.592670-04	1.415320-04	1.601620-04	1.626240-04	1.358660-04	0.0	0.0	0.0	
41	1.464980-04	1.343680-04	1.586990-04	1.752620-04	1.379550-04	0.0	0.0	0.0	
42	1.231580-04	1.329260-04	1.564220-04	1.615630-04	0.0	0.0	0.0	0.0	
43	1.360730-04	1.475050-04	1.445040-04	1.371770-04	0.0	0.0	0.0	0.0	
44	1.906360-04	1.715240-04	1.416840-04	0.0	0.0	0.0	0.0	0.0	
45	2.323800-04	1.925380-04	0.0	0.0	0.0	0.0	0.0	0.0	
46	2.421280-04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
47	2.361910-04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

MAT. NO.	MAT. NAME	VOLUME	MASS	NEUTRON HEAT GEN. RATE	GAMMA HEAT GEN. RATE	TOTAL HEAT GEN. RATE
65	LIH7	2.114880+04	1.764240+04	6.420320+02	3.683650+02	1.010400+03
69	AL	8.619710+03	2.329910+04	9.653140+00	2.501880+02	2.598410+02
73	LIHNAT	2.723230+05	2.271720+05	5.257140+02	2.467210+02	7.724350+02
77	TUNGSTEN	1.329630+04	2.566180+05	2.124970+00	1.133670+03	1.135790+03

81	LIH7CLAD	1.95570D+04	2.32433D+04	6.72749D+02	5.81687D+02	1.25444D+03
85	LIHNCLAD	1.00462D+05	1.25461D+05	1.55056D+03	1.88981D+02	1.73954D+03
93	LIHNCLAD	3.60884D+03	1.57706D+04	3.65864D+00	2.07488D+01	2.44075D+01
97	LIHNCLAD	2.05706D+04	2.27836D+04	5.82392D+01	1.34484D+01	7.16877D+01
101	LIH7CLAD	2.18313D+03	4.16518D+03	2.41717D+01	4.04502D+01	6.46218D+01

TOTAL VOLUME (EXCLUDING GAP REGIONS) = 4.61770D+05

TOTAL MASS OF ALL MATERIALS = 7.16155D+05

TOTAL NEUTRON HEAT GEN. RATE = 3.48890D+03
TOTAL GAMMA HEAT GEN. RATE = 2.84426D+03
TOTAL NEUTRON AND GAMMA HEAT GEN. RATE = 6.33316D+03

HEATING6 02/12/83 DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87 IBM3033/ 0
NSORNL1 17.54.01 01-07-88

MAP OF THE NODE NUMBERS

GROSS GRID			1	2	3	4	5	6	7	8	9	10	11	12	13
			I	I	I	I	I	I	I	I	I	I	I	I	I
FINE GRID			1	2	3	4	5	6	7	8	9	10	11	12	13
		DISTANCE	-0.01	0.01	1.50	3.00	4.90	5.60	7.62	9.63	11.65	13.67	15.68	17.70	19.30
1	1	58.27	0I	0	0	0	0	0	0	0	0	0	0	0	0
2	2	59.40	0I	0	0	0	0	0	0	0	0	0	0	0	0
3	3	60.53	0I	0	0	0	0	0	0	0	0	0	0	0	0
4	4	61.67	0I	0	0	0	0	0	0	0	0	0	0	0	0
5	5	62.80	0I	0	0	0	0	0	0	0	0	0	0	0	0
6	6	63.80	0I	45	46	47	48	49	50	51	52	53	54	55	56
7	7	65.80	0I	85	86	87I	88	89I	90	91	92	93	94	95	96
8	8	67.80	0I	125	126	127I	128	129I	130	131	132	133	134	135	136
9	9	69.80	0I	165	166	167I	168	169I	170	171	172	173	174	175	176
10	10	71.80	0I	205	206	207	208	209	210	211	212	213	214	215	216
11	11	72.60	0I	245	246	247	248	249	250	251	252	253	254	255	256
12	12	74.31	0I	285	286	287I	288	289I	290	291	292	293	294	295	296
13	13	74.51	0I	325	326	327I	328	329I	330	331	332	333	334	335	336
14	14	74.81	0I	364	365	366I	367	368I	369	370	371	372	373	374	375
15	15	75.31	0I	403	404	405I	406	407I	408	409	410	411	412	413	414
16	16	75.41	0I	442	443	444I	445	446I	447	448	449	450	451	452	453
17	17	75.71	0I	481	482	483I	484	485I	486	487	488	489	490	491	492
18	18	76.11	0I	520	521	522I	523	524I	525	526	527	528	529	530	531
19	19	76.51	0I	559	560	561I	562	563I	564	565	566	567	568	569	570
20	20	76.61	0I	598	599	600I	601	602I	603	604	605	606	607	608	609
21	21	76.91	0I	637	638	639I	640	641I	642	643	644	645	646	647	648
22	22	77.31	0I	676	677	678I	679	680I	681	682	683	684	685	686	687
23	23	77.61	0I	715	716	717I	718	719I	720	721	722	723	724	725	726
24	24	77.71	0I	754	755	756I	757	758I	759	760	761	762	763	764	765
25	25	77.81	0I	793	794	795I	796	797I	798	799	800	801	802	803	804
26	26	78.11	0I	832	833	834I	835	836I	837	838	839	840	841	842	843
27	27	78.51	0I	871	872	873I	874	875I	876	877	878	879	880	881	882
28	28	78.61	0I	910	911	912I	913	914I	915	916	917	918	919	920	921
29	29	78.81	0I	946	947	948I	949	950I	951	952	953	954	955	956	957
30	30	78.91	0I	985	986	987I	988	989I	990	991	992	993	994	995	996
31	31	79.31	0I	1024	1025	1026I	1027	1028I	1029	1030	1031	1032	1033	1034	1035
32	32	79.61	0I	1063	1064	1065I	1066	1067I	1068	1069	1070	1071	1072	1073	1074
33	33	79.70	0I	1102	1103	1104I	1105	1106I	1107	1108	1109	1110	1111	1112	1113
34	34	79.80	0I	1141	1142	1143I	1144	1145I	1146	1147	1148	1149	1150	1151	1152
35	35	80.10	0I	1180	1181	1182I	1183	1184I	1185	1186	1187	1188	1189	1190	1191
36	36	80.50	0I	1219	1220	1221I	1222	1223I	1224	1225	1226	1227	1228	1229	1230
37	37	80.80	0I	1258	1259	1260I	1261	1262I	1263	1264	1265	1266	1267	1268	1269
38	38	81.20	0I	1297	1298	1299I	1300	1301I	1302	1303	1304	1305	1306	1307	1308
39	39	81.40	0I	1336	1337	1338	1339	1340	1341	1342	1343	1344	1345	1346	1347
40	40	81.70	0I	1376	1377	1378	1379	1380	1381	1382	1383	1384	1385	1386	1387
41	41	82.20	0I	1416	1417	1418	1419	1420	1421	1422	1423	1424	1425	1426	1427
42	42	82.50	0I	1456	1457	1458	1459	1460	1461	1462	1463	1464	1465	1466	1467
43	43	82.70	0I	1496	1497	1498	1499	1500	1501	1502	1503	1504	1505	1506	1507
44	44	83.00	0I	1536	1537	1538	1539	1540	1541	1542	1543	1544	1545	1546	1547
45	45	83.20	0I	1576	1577	1578	1579	1580	1581	1582	1583	1584	1585	1586	1587
46	46	83.70	0I	1616	1617	1618	1619	1620	1621	1622	1623	1624	1625	1626	1627
47	47	84.20	0I	1656	1657	1658	1659	1660	1661	1662	1663	1664	1665	1666	1667
48	48	84.50	0I	1696	1697	1698	1699	1700	1701	1702	1703	1704	1705	1706	1707
49	49	84.70	0I	1736	1737	1738	1739	1740	1741	1742	1743	1744	1745	1746	1747
50	50	85.20	0I	1776	1777	1778	1779	1780	1781	1782	1783	1784	1785	1786	1787
51	51	85.50	0I	1816	1817	1818	1819	1820	1821	1822	1823	1824	1825	1826	1827
52	52	85.70	0I	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867
53	53	86.20	0I	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	1907

54	54	86.40	01	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	
55	55	88.99	01	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	
56	56	91.78	01	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	
57	57	94.57	01	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	
58	58	97.36	01	2116	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	
59	59	100.14	01	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	
60	60	102.93	01	2206	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	
61	61	105.72	01	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	
62	62	108.51	01	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	
63	63	111.30	01	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	
64	64	113.97	01	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	
65	65	116.65	01	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	
66	66	119.32	01	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	
67	67	122.00	01	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	
68	68	124.75	01	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	
69	69	127.50	01	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	
70	70	130.25	01	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	
71	71	133.00	01	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	

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HEATING6 02/12/83          DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87                    IBM3033/   0
NSORNL1                                                                                                        17.54.01    01-07-88
                                                   MAP OF THE NODE NUMBERS
GROSS GRID          14      15      16      17      18      19      20      21      22      23      24      25      26
                     I       I       I       I       I       I       I       I       I       I       I       I       I
  FINE GRID         14      15      16      17      18      19      20      21      22      23      24      25      26
      DISTANCE    20.60   21.90   23.40   23.70   24.90   25.20   26.40   26.70   27.20   27.50   27.80   30.20   30.50
 1  1   58.27 ----0-------0-------0-------0-------0-------0-------0-------0-------0-------0-------0-------0-------0---
 2  2   59.40    0       0       0       0       0       0       0       0       0       0       0       0       0
 3  3   60.53    0       0       0       0       0       0       0       0       0       0       0       0       0
 4  4   61.67    0       0       0       0       0       0       0       0       0       0       0       0       0
 5  5   62.80    0       0       0       0       0       0       0       0       0       0       0       0     291--
 6  6   63.80 ---57------58------59------60------61------62------63------64------65------66------67------68------691
 7  7   65.80 ---97------98------99-----100-----101-----102-----103-----104-----105-----106-----107-----108-----109---
 8  8   67.80  137     138     139     140     141     142     143     144     145     146     147     148     149
 9  9   69.80 --177-----178-----179-----188-----181-----182-----183-----184-----185-----186-----187-----188-----189---
10 10   71.80 --217-----218-----219-----220-----221-----222-----223-----224-----225-----226-----227-----228-----229---
11 11   72.60 --257-----258-----259-----260-----261-----262-----263-----264-----265-----266-----267-----268-----269---
12 12   74.31 --297-----298-----299-----300-----301-----302-----303-----304-----305-----306-----307-----308-----309---
13 13   74.51  337     338     339     340     341     342     343     344     345     346     347     348     349
14 14   74.81  376     377     378     379     380     381     382     383     384     385     386     387     388
15 15   75.31  415     416     417     418     419     420     421     422     423     424     425     426     427
16 16   75.41  454     455     456     457     458     459     460     461     462     463     464     465     466
17 17   75.71  493     494     495     496     497     498     499     500     501     502     503     504     505
18 18   76.11  532     533     534     535     536     537     538     539     540     541     542     543     544
19 19   76.51  571     572     573     574     575     576     577     578     579     580     581     582     583
20 20   76.61  610     611     612     613     614     615     616     617     618     619     620     621     622
21 21   76.91  649     650     651     652     653     654     655     656     657     658     659     660     661
22 22   77.31  688     689     690     691     692     693     694     695     696     697     698     699     700
23 23   77.61  727     728     729     730     731     732     733     734     735     736     737     738     739
24 24   77.71  766     767     768     769     770     771     772     773     774     775     776     777    7781--
25 25   77.81  805     806     807     808     809     810     811     812     813     814     815     816    8171
26 26   78.11  844     845     846     847     848     849     850     851     852     853     854     855    8561
27 27   78.51  883     884     885     886     887     888     889     890     891    8921-----893-----894-----8951
28 28   78.61  922     923     924     925     926     927     928     929     930    9311       0    9321-----933---
29 29   78.81  958     959     960     961     962     963     964     965     966    9671       0    9681    969
30 30   78.91  997     998     999    1000    1001    1002    1003    1004    1005   10061       0   10071   10081--
31 31   79.31 1036    1037    1038    1039    1040    1041    1042    1043    1044   10451       0   10461   10471
32 32   79.61 1075    1076    1077    1078    1079    1080    1081    1082    1083   10841       0   10851   10861
33 33   79.70 1114    1115    1116    1117    1118    1119   11201----1121-----1122-----11231       0   11241   11251
34 34   79.80 1153    1154    1155    1156    1157    1158   11591       0   11601----1161-----1162-----11631   11641
35 35   80.10 1192    1193    1194    1195    1196    1197   11981       0   11991   12001----1201-----1202-----12031
36 36   80.50 1231    1232    1233    1234    1235    1236   12371       0   12381   12391    1240    1241   12421--
37 37   80.80 1270    1271    1272    1273    1274    1275   12761       0   12771   12781    1279    1280   12811
38 38   81.20 -1309-----1310-----1311-----1312-----1313-----1314-----13151       0   13161   13171    1318    1319   13201
39 39   81.40 -1348-----1349-----1350-----1351-----1352-----1353-----1354-----1355-----13561   13571    1358    1359   13601
40 40   81.70 -1388-----1389-----1398-----1391-----1392-----1393-----1394-----1395-----1396-----13971    1398    1399   14001
41 41   82.20  1428    1429    1430    1431    1432    1433    1434    1435    1436   14371----1438-----1439-----14481
42 42   82.50  1468    1469    1470    1471    1472    1473    1474    1475    1476   14771   14781----1479-----1488---
43 43   82.70  1508    1509    1510    1511    1512    1513   15141----1515-----1516-----15171   15181    1519   15201--
44 44   83.00  1548    1549    1550    1551    1552    1553    1554    1555----1556-----1557-----15581    1559   15601
45 45   83.20  1588    1589    1590    1591    1592    1593    1594    1595    1596   15971----1598-----1599-----16081
46 46   83.70  1628    1629    1630    1631    1632    1633    1634    1635    1636    1637    1638    1639    1640
47 47   84.20  1668    1669    1670    1671    1672----1673-----1674    1675    1676    1677    1678    1679    1680
48 48   84.50  1708    1709    1710    1711    1712    1713----1714-----1715    1716    1717    1718    1719    1720
49 49   84.70  1748    1749    1750    1751    1752    1753    1754----1755-----1756-----1757    1758    1759    1760
50 50   85.20  1788    1789   17901----1791-----1792    1793    1794    1795    1796    1797    1798    1799    1800
51 51   85.50  1828    1829   18301    1831----1832-----1833    1834    1835    1836    1837    1838    1839    1840
52 52   85.70  1868    1869   18701    1871    1872----1873-----1874----1875-----1876-----1877-----1878-----1879-----1888---
53 53   86.20 -1908-----1909-----19101----1911----1912----1913-----1914-----1915-----1916-----1917-----1918-----1919-----1928---
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54	54	86.40	-1951-----	1952-----	1953-----	1954-----	1955-----	1956-----	1957-----	1958-----	1959-----	1960-----	1961-----	1962-----	1963---
55	55	88.99	-1994-----	1995-----	1996-----	1997-----	1998-----	1999-----	2000-----	2001-----	2002-----	2003-----	2004-----	2005-----	2006---
56	56	91.78	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
57	57	94.57	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094
58	58	97.36	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138
59	59	100.14	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183
60	60	102.93	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228
61	61	105.72	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273
62	62	108.51	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319
63	63	111.30	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365
64	64	113.97	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411
65	65	116.65	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457
66	66	119.32	-2489-----	2490-----	2491-----	2492-----	2493-----	2494-----	2495-----	2496-----	2497-----	2498-----	2499-----	2500-----	2501---
67	67	122.00	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544
68	68	124.75	-2574-----	2575-----	2576-----	2577-----	2578-----	2579-----	2580-----	2581-----	2582-----	2583-----	2584-----	2585-----	2586---
69	69	127.50	2614	2615	2616	2617	2618	2619	2620	2621	2622	26231----	2624-----	2625-----	2626---
70	70	130.25	-2648-----	2649-----	2650-----	2651-----	2652-----	2653-----	2654-----	2655-----	2656-----	26571	2658	2659	26601--
71	71	133.00	-2679-----	2680-----	2681-----	2682-----	2683-----	2684-----	2685-----	2686-----	2687-----	2688-----	2689-----	2690-----	26911--

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HEATING6 02/12/83          DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87          18M3033/   0
NSORWL1                                                                                             17.54.01    01-07-88
                                                MAP OF THE NODE NUMBERS
GROSS GRID              27      28      29      30      31      32      33      34      35      36      37      38      39
                         I       I       I       I       I       I       I       I       I       I       I       I       I
  FINE GRID             27      28      29      30      31      32      33      34      35      36      37      38      39
      DISTANCE       30.80   33.20   33.50   33.80   35.30   35.60   35.90   37.41   37.71   38.01   38.27   38.57   38.87
 1   1   58.27 ----0-------0-------0-------0-------0-------0-------0-------0-------0-------0-------11------2---
 2   2   59.40   0       0       0       0       0       0       0       0       0       0       0       51      6
 3   3   60.53   0       0       0       0       0       91------10------11------12------13------14------151     16
 4   4   61.67   0       0       0       0       0       191     20      21      221-----23------24------251     26
 5   5   62.80 ---30------31------32------33------34------351     36      37      381     39      40      411     42
 6   6   63.80  70      71      721-----73------74------75------76------77------781     79      80      811     82
 7   7   65.80 --110-----111-----1121    113     114     115     116     117     118     119     120     1211    122
 8   8   67.80 150     151     152     153     154     155     156     157     158     159     160     1611    162
 9   9   69.80 --190-----191-----192-----193-----194-----195-----196-----197-----198-----199-----200-----2011    202
10  10   71.80 --230-----231-----232-----233-----234-----235-----236-----237-----238-----239-----240-----2411----242---
11  11   72.60 --270-----271-----272-----273-----274-----275-----276-----277-----278-----279-----280-----281-----282---
12  12   74.31 --310-----311-----312-----313-----314-----315-----316-----317-----3181----319-----320-----321-----322---
13  13   74.51 350     351     352     353     354     355     356     357     3581    0       3591----360-----361---
14  14   74.81 389     390     391     392     393     394     395     396     3971    0       3981    3991----400---
15  15   75.31 428     429     430     431     432     4331----434-----435-----4361    0       4371    4381    439
16  16   75.41 467     468     469     470     471     4721    0       4731----474-----475-----4761    4771    478
17  17   75.71 506     507     508     509     510     5111    0       5121    5131----514-----515-----5161    517
18  18   76.11 545     546     547     548     549     5501    0       5511    5521    553     554     5551----5561--
19  19   76.51 584     585     5861----587-----588-----5891    0       5901    5911    592     593     5941    5951
20  20   76.61 623     624     6251    0       6261----627-----628-----6291    6301    631     632     6331    6341
21  21   76.91 662     663     6641    0       6651    6661----667-----668-----6691    670     671     6721    6731
22  22   77.31 701     702     7031    0       7041    7051    706     707     7081----709-----710-----7111    7121
23  23   77.61 740     741     7421    0       7431    7441    745     746     7471    7481----749-----750-----7511
24  24   77.71 --779-----780-----7811    0       7821    7831    784     785     7861    7871    788     7891----790---
25  25   77.81  0      8181----819-----820-----8211    8221    823     824     8251    8261    827     8281    829
26  26   78.11  0      8571    8581----859-----860-----8611    862     863     8641    8651    866     8671    868
27  27   78.51  0      8961    8971    898     899     9001----901-----902-----9031    9041    905     9061    907
28  28   78.61 --934-----935-----9361    937     938     9391    0       0       0       9401    941     9421    943
29  29   78.81 970     971     9721    973     974     9751    9761----977-----978-----9791    980     9811    982
30  30   78.91 -1009----1010----10111    1012    1013    10141   10151   1016    10171---1018----1019----10201   1021
31  31   79.31 1048    1049    10501---1051----1052----10531   10541   1055    10561   1057    1058    10591   1060
32  32   79.61 1087    1088    10891   10901---1091----1092----10931   1094    10951   1096    1097    10981   1099
33  33   79.70 1126    1127    11281   11291   1130    11311---1132----1133----11341   1135    1136    11371   1138
34  34   79.80 1165    1166    11671   11681   1169    11701   1171    1172    1173    1174    1175    11761   1177
35  35   80.10 1204    1205    12061   12071   1208    12091   1210    1211    1212    1213    1214    12151   1216
36  36   80.50 -1243----1244----12451   12461   1247    12481   1249    1250    1251    1252    1253    12541   1255
37  37   80.80 12821---1283----1284----12851   1286    12871   1288    1289    1290    1291    1292    12931   1294
38  38   81.20 13211   1322    1323    1324    1325    13261   1327    1328    1329    1330    1331    13321   1333
39  39   81.40 13611   1362    1363    1364    1365    13661   1367    1368    1369    1370    1371    13721   1373
40  40   81.70 14011   1402    14031---1404----1405----14061   1407    1408    1409    1410    1411    14121   1413
41  41   82.20 14411   1442    14431   1444    1445    1446    1447    1448    1449    1450    1451    14521   1453
42  42   82.50 -14811   1482    14831   1484    1485    1486    1487    1488    1489    1490    1491    14921   1493
43  43   82.70 -1521----1522----15231   1524    1525    1526    1527    1528    1529    1530    1531    15321   1533
44  44   83.00 1561    1562    1563    1564    1565    1566    1567    1568    1569    1570    1571    15721   1573
45  45   83.20 1601    1602    1603    1604    1605    1606    1607    1608    1609    1610    1611    16121   1613
46  46   83.70 1641    1642    1643    1644    1645    1646    1647    1648    1649    1650    1651    16521   1653
47  47   84.20 1681    1682    1683    1684    1685    1686    1687    1688    1689    1690    1691    16921   1693
48  48   84.50 1721    1722    1723    1724    1725    1726    1727    1728    1729    1730    1731    17321   1733
49  49   84.70 1761    1762    1763    1764    1765    1766    1767    1768    1769    1770    1771    17721   1773
50  50   85.20 1801    1802    1803    1804    1805    1806    1807    1808    1809    1810    1811    18121   1813
51  51   85.50 1841    1842    1843    1844    1845    1846    1847    1848    1849    1850    1851    18521   1853
52  52   85.70 -1881----1882----1883----1884----1885----1886----1887----1888----1889----1890----1891----18921---1893---
53  53   86.20 -1921----1922----1923----1924----1925----1926----1927----1928----1929----1930----1931----1932----1933---
```

54	54	86.40	-1964-----	1965-----	1966-----	1967-----	1968-----	1969-----	1970-----	1971-----	1972-----	1973-----	1974-----	1975-----	1976---
55	55	88.99	-2007-----	2008-----	2009-----	2010-----	2011-----	2012-----	2013-----	2014-----	2015-----	2016-----	2017-----	2018-----	2019---
56	56	91.78	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063
57	57	94.57	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107
58	58	97.36	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151
59	59	100.14	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196
60	60	102.93	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241
61	61	105.72	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286
62	62	108.51	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332
63	63	111.30	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378
64	64	113.97	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424
65	65	116.65	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470
66	66	119.32	-2502-----	2503-----	2504-----	2505-----	2506-----	2507-----	2508-----	2509-----	2510-----	2511-----	2512-----	2513-----	2514---
67	67	122.00	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557
68	68	124.75	-2587-----	2588-----	2589	2590	2591	2592	2593	2594	2595	----2596-----	2597-----	2598-----	2599---
69	69	127.50	-2627-----	2628-----	2629	2630	2631	2632	----2633-----	2634-----	2635	0	0	0	0
70	70	130.25	-2661-----	2662-----	2663-----	2664-----	2665-----	2666	0	0	0	0	0	0	0
71	71	133.00	----0--------	0--------	0--------	0--------	0--------	0--------	0--------	0--------	0--------	0--------	0--------	0--------	0---

```
HEATING6 02/12/83          DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87          IBM3033/   0
HSORNL1                                                                                             17.54.01    01-07-88
                                                   MAP OF THE NODE NUMBERS
GROSS GRID          40      41      42      43      44      45      46      47
                     I       I       I       I       I       I       I       I
  FINE GRID         40      41      42      43      44      45      46      47
      DISTANCE    39.23   39.43   42.52   45.60   48.69   51.25   53.80   56.36
 1   1   58.27 ----3I-------4I-------0-------0-------0-------0-------0-------0I
 2   2   59.40    7I      8I       0       0       0       0       0       0I
 3   3   60.53   17I     18I       0       0       0       0       0       0I
 4   4   61.67   27I     28I       0       0       0       0       0       0I
 5   5   62.80   43I     44I       0       0       0       0       0       0I
 6   6   63.80   83I     84I       0       0       0       0       0       0I
 7   7   65.80  123I    124I       0       0       0       0       0       0I
 8   8   67.80  163I    164I       0       0       0       0       0       0I
 9   9   69.80  203I    204I       0       0       0       0       0       0I
10  10   71.80 --243I   244I       0       0       0       0       0       0I
11  11   72.60 --283I   284I       0       0       0       0       0       0I
12  12   74.31 --323I   324I       0       0       0       0       0       0I
13  13   74.51 --362I   363I       0       0       0       0       0       0I
14  14   74.81 --401I   402I       0       0       0       0       0       0I
15  15   75.31  440I    441I       0       0       0       0       0       0I
16  16   75.41  479I    480I       0       0       0       0       0       0I
17  17   75.71  518I    519I       0       0       0       0       0       0I
18  18   76.11 --557I   558I       0       0       0       0       0       0I
19  19   76.51  596I    597I       0       0       0       0       0       0I
20  20   76.61  635I    636I       0       0       0       0       0       0I
21  21   76.91  674I    675I       0       0       0       0       0       0I
22  22   77.31  713I    714I       0       0       0       0       0       0I
23  23   77.61  752I    753I       0       0       0       0       0       0I
24  24   77.71 --791I   792I       0       0       0       0       0       0I
25  25   77.81  830I    831I       0       0       0       0       0       0I
26  26   78.11  869I    870I       0       0       0       0       0       0I
27  27   78.51  908I    909I       0       0       0       0       0       0I
28  28   78.61  944I    945I       0       0       0       0       0       0I
29  29   78.81  983I    984I       0       0       0       0       0       0I
30  30   78.91 1022I   1023I       0       0       0       0       0       0I
31  31   79.31 1061I   1062I       0       0       0       0       0       0I
32  32   79.61 1100I   1101I       0       0       0       0       0       0I
33  33   79.70 1139I   1140I       0       0       0       0       0       0I
34  34   79.80 1178I   1179I       0       0       0       0       0       0I
35  35   80.10 1217I   1218I       0       0       0       0       0       0I
36  36   80.50 1256I   1257I       0       0       0       0       0       0I
37  37   80.60 1295I   1296I       0       0       0       0       0       0I
38  38   81.20 1334I   1335I       0       0       0       0       0       0I
39  39   81.40 1374I   1375I       0       0       0       0       0       0I
40  40   81.70 1414I   1415I       0       0       0       0       0       0I
41  41   82.20 1454I   1455I       0       0       0       0       0       0I
42  42   82.50 1494I   1495I       0       0       0       0       0       0I
43  43   82.70 1534I   1535I       0       0       0       0       0       0I
44  44   83.00 1574I   1575I       0       0       0       0       0       0I
45  45   83.20 1614I   1615I       0       0       0       0       0       0I
46  46   83.70 1654I   1655I       0       0       0       0       0       0I
47  47   84.20 1694I   1695I       0       0       0       0       0       0I
48  48   84.50 1734I   1735I       0       0       0       0       0       0I
49  49   84.70 1774I   1775I       0       0       0       0       0       0I
50  50   85.20 1814I   1815I       0       0       0       0       0       0I
51  51   85.50 1854I   1855I       0       0       0       0       0       0I
52  52   85.70 -1894I  1895I       0       0       0       0       0       0I
53  53   86.20 -1934I  1935I----1936-----1937-----1938I       0       0       0I
```

54	54	86.40	1977	1978	1979	1980	1981	0	0	0	0
55	55	88.99	2020	2021	2022	2023	2024	2025	0	0	0
56	56	91.78	2064	2065	2066	2067	2068	2069	0	0	0
57	57	94.57	2108	2109	2110	2111	2112	2113	0	0	0
58	58	97.36	2152	2153	2154	2155	2156	2157	2158	0	0
59	59	100.16	2197	2198	2199	2200	2201	2202	2203	0	0
60	60	102.95	2242	2243	2244	2245	2246	2247	2248	0	0
61	61	105.72	2287	2288	2289	2290	2291	2292	2293	2294	0
62	62	108.51	2333	2334	2335	2336	2337	2338	2339	2340	0
63	63	111.30	2379	2380	2381	2382	2383	2384	2385	2386	0
64	64	113.97	2425	2426	2427	2428	2429	2430	2431	2432	0
65	65	116.65	2471	2472	2473	2474	2475	2476	0	0	0
66	66	119.32	2515	2516	2517	2518	2519	0	0	0	0
67	67	122.00	2558	2559	2560	2561	0	0	0	0	0
68	68	124.75	2600	2601	0	0	0	0	0	0	0
69	69	127.50	0	0	0	0	0	0	0	0	0
70	70	130.25	0	0	0	0	0	0	0	0	0
71	71	133.00	0	0	0	0	0	0	0	0	0

```
HEATING6 02/12/83          DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87          IBM3033/   0
NSORWL1                                                                                                 17.54.35    01-07-88
                          STEADY STATE TEMPERATURE DISTRIBUTION  AFTER    0 ITERATIONS, TIME = 0.0
GROSS GRID                1       2       3       4       5       6       7       8       9      10      11      12      13
                          I       I       I       I       I       I       I       I       I       I       I       I       I
  FINE GRID               1       2       3       4       5       6       7       8       9      10      11      12      13
      DISTANCE          -0.01    0.01    1.50    3.00    4.90    5.60    7.62    9.63   11.65   13.67   15.68   17.70   19.30
 1  1    58.27   010------0:0------0:0------0:0------0:0------0:0------0:0------0:0------0:0------0:0------0:0------0:0------0:0-
 2  2    59.40   010     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 3  3    60.53   010     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 4  4    61.67   010     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 5  5    62.80   010     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0
 6  6    63.80   010----750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00
 7  7    65.80   010----750:00---750:00---750100  750.00  750100---750:00---750:00---750:00---750:00---750:00---750:00
 8  8    67.80   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
 9  9    69.80   010----750:00---750:00---750100  750.00  750100---750:00---750:00---750:00---750:00---750:00---750:00
10 10    71.80   010----750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00
11 11    72.60   010----750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00
12 12    74.31   010----750:00---750:00---750100  750.00  750100---750:00---750:00---750:00---750:00---750:00---750:00
13 13    74.51   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
14 14    74.81   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
15 15    75.31   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
16 16    75.41   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
17 17    75.71   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
18 18    76.11   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
19 19    76.51   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
20 20    76.61   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
21 21    76.91   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
22 22    77.31   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
23 23    77.61   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
24 24    77.71   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
25 25    77.81   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
26 26    78.11   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
27 27    78.51   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
28 28    78.61   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
29 29    78.81   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
30 30    78.91   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
31 31    79.31   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
32 32    79.61   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
33 33    79.70   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
34 34    79.80   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
35 35    80.10   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
36 36    80.50   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
37 37    80.80   010   750.00  750.00  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00
38 38    81.20   010----750:00---750:00---750100  750.00  750100---750:00---750:00---750:00---750:00---750:00---750:00
39 39    81.40   010----750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00
40 40    81.70   010----750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00
41 41    82.20   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
42 42    82.50   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
43 43    82.70   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
44 44    83.00   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
45 45    83.20   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
46 46    83.70   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
47 47    84.20   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
48 48    84.50   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
49 49    84.70   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
50 50    85.20   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
51 51    85.50   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
52 52    85.70   010   750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00
53 53    86.20   010----750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00---750:00
```

54	54	86.60	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
55	55	88.99	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
56	56	91.78	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
57	57	94.57	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
58	58	97.36	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
59	59	100.14	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
60	60	102.93	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
61	61	105.72	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
62	62	108.51	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
63	63	111.30	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
64	64	113.97	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
65	65	116.65	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
66	66	119.32	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
67	67	122.00	010	750.00	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
68	68	124.75	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
69	69	127.50	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
70	70	130.25	010	750.00	750.00	750100	750.00	750100	750.00	750.00	750.00	750.00	750.00	750.00	750.00
71	71	133.00	010	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00

HEATING6 02/12/83 DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87 18M3033/ 0
NSORNL1 17.54.35 01-07-88

STEADY STATE TEMPERATURE DISTRIBUTION AFTER 0 ITERATIONS, TIME = 0.0

GROSS GRID			14	15	16	17	18	19	20	21	22	23	24	25	26
			I	I	I	I	I	I	I	I	I	I	I	I	I
FINE GRID			14	15	16	17	18	19	20	21	22	23	24	25	26
		DISTANCE	20.60	21.90	23.40	25.70	24.90	25.20	26.40	26.70	27.20	27.50	27.80	30.20	30.50
1	1	58.27	----0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0-
2	2	59.40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	3	60.53	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	4	61.67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	5	62.80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	750100
6	6	63.80	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750100
7	7	65.80	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00
8	8	67.80	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
9	9	69.80	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00
10	10	71.80	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00
11	11	72.60	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00
12	12	74.31	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00
13	13	74.51	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
14	14	74.81	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
15	15	75.31	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
16	16	75.41	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
17	17	75.71	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
18	18	76.11	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
19	19	76.51	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
20	20	76.61	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
21	21	76.91	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
22	22	77.31	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
23	23	77.61	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
24	24	77.71	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750100
25	25	77.81	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750100
26	26	78.11	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750100
27	27	78.51	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750100	---750:00	---750:00	---750100
28	28	78.61	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750100	0.0	750100	---750:00
29	29	78.81	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750100	0.0	750100	750.00
30	30	78.91	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750100	0.0	750100	750100
31	31	79.31	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750100	0.0	750100	750100
32	32	79.61	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750100	0.0	750100	750100
33	33	79.70	750.00	750.00	750.00	750.00	750.00	750.00	750100	---750:00	---750:00	---750100	0.0	750100	750100
34	34	79.80	750.00	750.00	750.00	750.00	750.00	750.00	750100	0.0	750100	---750:00	---750:00	---750100	750100
35	35	80.10	750.00	750.00	750.00	750.00	750.00	750.00	750100	0.0	750100	750100	---750:00	---750:00	---750100
36	36	80.50	750.00	750.00	750.00	750.00	750.00	750.00	750100	0.0	750100	750100	750.00	750.00	750100
37	37	80.80	750.00	750.00	750.00	750.00	750.00	750.00	750100	0.0	750100	750100	750.00	750.00	750100
38	38	81.20	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750100	0.0	750100	750100	750.00	750.00	750100
39	39	81.40	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750100	750100	750.00	750.00	750100
40	40	81.70	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750100	750.00	750.00	750100
41	41	82.20	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750100	---750:00	---750:00	---750100
42	42	82.50	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750100	750100	---750:00	---750:00
43	43	82.70	750.00	750.00	750.00	750.00	750.00	750.00	750100	---750:00	---750:00	---750100	750100	750.00	750100
44	44	83.00	750.00	750.00	750.00	750.00	750.00	750.00	750100	750100	---750:00	---750:00	---750100	750.00	750100
45	45	83.20	750.00	750.00	750.00	750.00	750.00	750.00	750100	750100	750.00	750100	---750:00	---750:00	---750100
46	46	83.70	750.00	750.00	750.00	750.00	750.00	750.00	750100	750100	750.00	750100	750.00	750.00	750.00
47	47	84.20	750.00	750.00	750.00	750.00	750100	---750:00	---750100	750100	750.00	750100	750.00	750.00	750.00
48	48	84.50	750.00	750.00	750.00	750.00	750100	750100	---750:00	---750100	750.00	750100	750.00	750.00	750.00
49	49	84.70	750.00	750.00	750.00	750.00	750100	750100	750100	---750:00	---750:00	---750100	750.00	750.00	750.00
50	50	85.20	750.00	750.00	750100	---750:00	---750100	750100	750100	750.00	750.00	750.00	750.00	750.00	750.00
51	51	85.50	750.00	750.00	750100	750100	---750:00	---750100	750100	750.00	750.00	750.00	750.00	750.00	750.00
52	52	85.70	750.00	750.00	750100	750100	750100	---750:00	---750100	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00
53	53	86.20	--750:00	---750:00	---750100	---750100	---750100	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00

54	54	86.40	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00
55	55	88.99	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00
56	56	91.78	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
57	57	94.57	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
58	58	97.36	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
59	59	100.14	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
60	60	102.93	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
61	61	105.72	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
62	62	108.51	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
63	63	111.30	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
64	64	113.97	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
65	65	116.65	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
66	66	119.32	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00
67	67	122.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
68	68	124.75	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00
69	69	127.50	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750:00	---750:00	---750:00	---750:00
70	70	130.25	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	750.00	750.00	750:00
71	71	133.00	--750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00	---750:00

```
HEATING6 02/12/83          DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87                    IBM3033/   0
NSORNL1                                                                                                        17.54.35    01-07-88
                                STEADY STATE TEMPERATURE DISTRIBUTION  AFTER    0 ITERATIONS, TIME = 0.0
GROSS GRID                27      28      29      30      31      32      33      34      35      36      37      38      39
                           I       I       I       I       I       I       I       I       I       I       I       I       I
   FINE GRID              27      28      29      30      31      32      33      34      35      36      37      38      39
        DISTANCE       30.80   33.20   33.50   33.80   35.30   35.60   35.90   37.41   37.71   38.01   38.27   38.57   38.87
 1   1     58.27 ----0.0------0.0------0.0------0.0------0.0------0.0------0.0------0.0------0.0------0.0------0.0---750100---750.00
 2   2     59.40    0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0     0.0  750100  750.00
 3   3     60.53    0.0     0.0     0.0     0.0     0.0  750100---750.00---750.00---750.00---750.00---750.00---750100  750.00
 4   4     61.67    0.0     0.0     0.0     0.0     0.0  750100  750.00  750.00  750100---750.00---750.00---750100  750.00
 5   5     62.80 --750.00---750.00---750.00---750.00---750.00---750100  750.00  750.00  750100  750.00  750.00  750100  750.00
 6   6     63.80  750.00  750.00  750100---750.00---750.00---750.00---750.00---750.00---750100  750.00  750.00  750100  750.00
 7   7     65.80 --750.00---750.00---750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
 8   8     67.80  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
 9   9     69.80 --750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750100  750.00
10  10     71.80 --750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750100---750.00
11  11     72.60 --750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00
12  12     74.31 --750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750100---750.00---750.00---750.00---750.00
13  13     74.51  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100     0.0  750100---750.00---750.00
14  14     74.81  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100     0.0  750100  750100---750.00
15  15     75.31  750.00  750.00  750.00  750.00  750.00  750100---750.00---750.00---750100     0.0  750100  750100  750.00
16  16     75.41  750.00  750.00  750.00  750.00  750.00  750100     0.0  750100---750.00---750.00---750100  750100  750.00
17  17     75.71  750.00  750.00  750.00  750.00  750.00  750100     0.0  750100  750100---750.00---750.00---750100  750.00
18  18     76.11  750.00  750.00  750.00  750.00  750.00  750100     0.0  750100  750100  750.00  750.00  750100---750100
19  19     76.51  750.00  750.00  750100---750.00---750.00---750100     0.0  750100  750100  750.00  750.00  750100  750100
20  20     76.61  750.00  750.00  750100     0.0  750100---750.00---750.00---750100  750100  750.00  750.00  750100  750100
21  21     76.91  750.00  750.00  750100     0.0  750100  750100---750.00---750.00---750100  750.00  750.00  750100  750100
22  22     77.31  750.00  750.00  750100     0.0  750100  750100  750.00  750.00  750100---750.00---750.00---750100  750100
23  23     77.61  750.00  750.00  750100     0.0  750100  750100  750.00  750.00  750100  750100---750.00---750.00---750100
24  24     77.71 --750.00---750.00---750100     0.0  750100  750100  750.00  750.00  750100  750100  750.00  750100---750.00
25  25     77.81    0.0  750100---750.00---750.00---750100  750100  750.00  750.00  750100  750100  750.00  750100  750.00
26  26     78.11    0.0  750100  750100---750.00---750.00---750100  750.00  750.00  750100  750100  750.00  750100  750.00
27  27     78.51    0.0  750100  750100  750.00  750.00  750100---750.00---750.00---750100  750100  750.00  750100  750.00
28  28     78.61 --750.00---750100  750100  750.00  750.00  750100     0.0     0.0     0.0  750100  750.00  750100  750.00
29  29     78.81  750.00  750.00  750100  750.00  750.00  750100  750100---750.00---750.00---750100  750.00  750100  750.00
30  30     78.91 --750.00---750.00---750100  750.00  750.00  750100  750100  750.00  750100---750.00---750.00---750100  750.00
31  31     79.31  750.00  750.00  750100---750.00---750.00---750100  750100  750.00  750100  750.00  750.00  750100  750.00
32  32     79.61  750.00  750.00  750100  750100---750.00---750.00---750100  750.00  750100  750.00  750.00  750100  750.00
33  33     79.70  750.00  750.00  750100  750100  750.00  750100---750.00---750.00---750100  750.00  750.00  750100  750.00
34  34     79.80  750.00  750.00  750100  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750100  750.00
35  35     80.10  750.00  750.00  750100  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750100  750.00
36  36     80.50 --750.00---750.00---750100  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750100  750.00
37  37     80.80  750100---750.00---750.00---750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750100  750.00
38  38     81.20  750100  750.00  750.00  750.00  750.00  750100  750.00  750.00  750.00  750.00  750.00  750100  750.00
39  39     81.40  750100  750.00  750.00  750.00  750.00  750100  750.00  750.00  750.00  750.00  750.00  750100  750.00
40  40     81.70  750100  750.00  750100---750.00---750.00---750100  750.00  750.00  750.00  750.00  750.00  750100  750.00
41  41     82.20  750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
42  42     82.50 --750100  750.00  750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
43  43     82.70 --750.00---750.00---750100  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
44  44     83.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
45  45     83.20  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
46  46     83.70  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
47  47     84.20  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
48  48     84.50  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
49  49     84.70  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
50  50     85.20  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
51  51     85.50  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750.00  750100  750.00
52  52     85.70 --750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750100---750.00
53  53     86.20 --750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00---750.00
```

54	54	86.60	--750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00
55	55	88.99	--750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00
56	56	91.78	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
57	57	94.57	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
58	58	97.36	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
59	59	100.14	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
60	60	102.93	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
61	61	105.72	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
62	62	108.51	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
63	63	111.30	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
64	64	113.97	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
65	65	116.65	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
66	66	119.32	--750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00	---750.00
67	67	122.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
68	68	124.75	--750.00	---750.00	---750.00	750.00	750.00	750.00	750.00	750.00	750.00	---750.00	---750.00	---750.00	---750.00
69	69	127.50	--750.00	---750.00	---750.00	750.00	750.00	750.00	---750.00	---750.00	---750.00	0.0	0.0	0.0	0.0
70	70	130.25	--750.00	---750.00	---750.00	---750.00	---750.00	---750.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	71	133.00	---0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0	------0.0

```
HEATING6 02/12/83          DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87          T6M3033/   0
NSORWL1                                                                                            17.54.35    01-07-88
                                STEADY STATE TEMPERATURE DISTRIBUTION  AFTER    0 ITERATIONS, TIME = 0.0
GROSS GRID          40      41      42      43      44      45      46      47
                     I       I       I       I       I       I       I       I
  FINE GRID         40      41      42      43      44      45      46      47
      DISTANCE    39.23   39.43   42.52   45.60   48.69   51.25   53.80   56.36
 1   1   58.27 --750100---750100----0.0-----0.0-----0.0-----0.0-----0.0-----010
 2   2   59.40   750100  750100    0.0     0.0     0.0     0.0     0.0     010
 3   3   60.53   750100  750100    0.0     0.0     0.0     0.0     0.0     010
 4   4   61.67   750100  750100    0.0     0.0     0.0     0.0     0.0     010
 5   5   62.80   750100  750100    0.0     0.0     0.0     0.0     0.0     010
 6   6   63.80   750100  750100    0.0     0.0     0.0     0.0     0.0     010
 7   7   65.80   750100  750100    0.0     0.0     0.0     0.0     0.0     010
 8   8   67.80   750100  750100    0.0     0.0     0.0     0.0     0.0     010
 9   9   69.80   750100  750100    0.0     0.0     0.0     0.0     0.0     010
10  10   71.80 --750100  750100    0.0     0.0     0.0     0.0     0.0     010
11  11   72.60 --750100  750100    0.0     0.0     0.0     0.0     0.0     010
12  12   74.31 --750100  750100    0.0     0.0     0.0     0.0     0.0     010
13  13   74.51 --750100  750100    0.0     0.0     0.0     0.0     0.0     010
14  14   74.81 --750100  750100    0.0     0.0     0.0     0.0     0.0     010
15  15   75.31   750100  750100    0.0     0.0     0.0     0.0     0.0     010
16  16   75.41   750100  750100    0.0     0.0     0.0     0.0     0.0     010
17  17   75.71   750100  750100    0.0     0.0     0.0     0.0     0.0     010
18  18   76.11 --750100  750100    0.0     0.0     0.0     0.0     0.0     010
19  19   76.51   750100  750100    0.0     0.0     0.0     0.0     0.0     010
20  20   76.61   750100  750100    0.0     0.0     0.0     0.0     0.0     010
21  21   76.91   750100  750100    0.0     0.0     0.0     0.0     0.0     010
22  22   77.31   750100  750100    0.0     0.0     0.0     0.0     0.0     010
23  23   77.61   750100  750100    0.0     0.0     0.0     0.0     0.0     010
24  24   77.71 --750100  750100    0.0     0.0     0.0     0.0     0.0     010
25  25   77.81   750100  750100    0.0     0.0     0.0     0.0     0.0     010
26  26   78.11   750100  750100    0.0     0.0     0.0     0.0     0.0     010
27  27   78.51   750100  750100    0.0     0.0     0.0     0.0     0.0     010
28  28   78.61   750100  750100    0.0     0.0     0.0     0.0     0.0     010
29  29   78.81   750100  750100    0.0     0.0     0.0     0.0     0.0     010
30  30   78.91   750100  750100    0.0     0.0     0.0     0.0     0.0     010
31  31   79.31   750100  750100    0.0     0.0     0.0     0.0     0.0     010
32  32   79.61   750100  750100    0.0     0.0     0.0     0.0     0.0     010
33  33   79.70   750100  750100    0.0     0.0     0.0     0.0     0.0     010
34  34   79.80   750100  750100    0.0     0.0     0.0     0.0     0.0     010
35  35   80.10   750100  750100    0.0     0.0     0.0     0.0     0.0     010
36  36   80.50   750100  750100    0.0     0.0     0.0     0.0     0.0     010
37  37   80.80   750100  750100    0.0     0.0     0.0     0.0     0.0     010
38  38   81.20   750100  750100    0.0     0.0     0.0     0.0     0.0     010
39  39   81.40   750100  750100    0.0     0.0     0.0     0.0     0.0     010
40  40   81.70 --750100  750100    0.0     0.0     0.0     0.0     0.0     010
41  41   82.20   750100  750100    0.0     0.0     0.0     0.0     0.0     010
42  42   82.50   750100  750100    0.0     0.0     0.0     0.0     0.0     010
43  43   82.70   750100  750100    0.0     0.0     0.0     0.0     0.0     010
44  44   83.00   750100  750100    0.0     0.0     0.0     0.0     0.0     010
45  45   83.20   750100  750100    0.0     0.0     0.0     0.0     0.0     010
46  46   83.70   750100  750100    0.0     0.0     0.0     0.0     0.0     010
47  47   84.20   750100  750100    0.0     0.0     0.0     0.0     0.0     010
48  48   84.50   750100  750100    0.0     0.0     0.0     0.0     0.0     010
49  49   84.70   750100  750100    0.0     0.0     0.0     0.0     0.0     010
50  50   85.20   750100  750100    0.0     0.0     0.0     0.0     0.0     010
51  51   85.50   750100  750100    0.0     0.0     0.0     0.0     0.0     010
52  52   85.70 --750100  750100    0.0     0.0     0.0     0.0     0.0     010
53  53   86.20 --750100  750100---750.00---750.00---750100  0.0     0.0     010
```

54	54	86.40	--750:00	---750:00	---750:00	---750:00	---750100	0.0	0.0	010	
55	55	88.99	--750:00	---750:00	---750:00	---750100	---750100	---750100	0.0	010	
56	56	91.78	750.00	750.00	750.00	750100	---750100	750100	0.0	010	
57	57	94.57	750.00	750.00	750.00	750.00	750100	750100	0.0	010	
58	58	97.36	750.00	750.00	750.00	750.00	750100	750100	---750100	010	
59	59	100.14	750.00	750.00	750.00	750.00	750100	---750100	750100	010	
60	60	102.93	750.00	750.00	750.00	750.00	750.00	750100	750100	010	
61	61	105.72	750.00	750.00	750.00	750.00	750.00	750100	750100	---750100	
62	62	108.51	750.00	750.00	750.00	750.00	750.00	750100	---750100	750100	
63	63	111.30	750.00	750.00	750.00	750.00	750100	---750:00	---750100	750100	
64	64	113.97	750.00	750.00	750.00	750100	---750100	750100	---750:00	---750100	
65	65	116.65	750.00	750.00	750100	---750100	750100	---750100	0.0	010	
66	66	119.32	--750:00	---750:00	---750100	750100	---750100	0.0	0.0	010	
67	67	122.00	750.00	750100	---750:00	---750100	0.0	0.0	0.0	010	
68	68	124.75	--750:00	---750100	0.0	0.0	0.0	0.0	0.0	010	
69	69	127.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	010	
70	70	130.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	010	
71	71	133.00	----0:0	------0:0	------0:0	------0:0	------0:0	------0:0	------0:0	------010	

TEMPERATURES ON NUMBERED BOUNDARIES

BOUNDARY NUMBER	TEMPERATURE
1	0.0
2	0.0
3	0.0

ELAPSED CPU TIME IS 0.0 SECONDS

THE MAXIMUM TEMPERATURE IS - 7.500000+02 (+-0.1 PERCENT)

MAX. TEMP. APPEARS AT NODES -

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50

THE MINIMUM TEMPERATURE IS - 7.500000+02 (+-0.1 PERCENT)

MIN. TEMP. APPEARS AT NODES -

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50

```
BEGIN THE STEADY STATE CALCULATIONS
NUMBER OF                                                    EXTRAPOLATION
ITERATIONS      CONVERGENCE      NODE      TEMPERATURE          FACTOR

     5          2.09496D-02      165       7.73928D+02       -1.35726D+01
    10          9.68884D-03       54       8.04757D+02        1.37992D+01
    15          8.35993D-03       89       8.25843D+02        3.41654D+00
    20          1.15250D-02       45       8.46848D+02        5.76395D+00
                                          BETA REDUCED TO 1.800

***** TABLE 65 MUST BE EVALUATED FOR  8.47359743D+02
      THE VALUE OF THE FUNCTION WILL BE  6.276000000-02 FOR ALL ARGUMENTS GREATER THAN  8.000000000+02
    25          3.80276D-03      126       8.39965D+02       -4.91009D-01
  6680         -5.29132D-12      403       8.45586D+02        1.20043D+01
                                          EXTRAPOLATION
  6685          1.46794D-12     1063       8.41371D+02        4.97068D+01
  6690          1.31051D-12     1063       8.41371D+02        4.68413D+01
  6695          1.18638D-12     1063       8.41371D+02        4.94722D+01
  6700         -1.08359D-12        3       6.19430D+02       -4.96999D-01
  6705         -1.01294D-12        3       6.19430D+02        7.47083D+01
                                          EXTRAPOLATION
THE NUMBER OF ITERATIONS BETWEEN TEMPERATURE DEPENDENT PARAMETER EVALUATIONS
 HAS BEEN SET TO 1 AFTER 6707 ITERATIONS
  6710         -1.47007D-12     2602       5.81595D+02        2.79646D+01
  6715         -1.16923D-12     2602       5.81595D+02        3.01330D+01
  6720         -1.00132D-12     2602       5.81595D+02        3.63308D+01
```

HEATING6 02/12/85 DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87 18M3033/ 0

HSORML1 18.18.18 01-07-88

STEADY STATE TEMPERATURE DISTRIBUTION AFTER 6721 ITERATIONS, TIME = 0.0

GROSS GRID			1	2	3	4	5	6	7	8	9	10	11	12	13
			I	I	I	I	I	I	I	I	I	I	I	I	I
FINE GRID			1	2	3	4	5	6	7	8	9	10	11	12	13
		DISTANCE	-0.01	0.01	1.50	3.00	4.90	5.60	7.62	9.63	11.65	13.67	15.68	17.70	19.30
1	1	58.27	010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2	59.40	010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	3	60.53	010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	4	61.67	010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	5	62.80	010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	6	63.80	010	880:49	880:24	879:41	877:23	876:86	871:46	865:20	857:33	847:97	837:52	825:56	815:55
7	7	65.80	010	877:28	877:02	876119	873.90	872162	867:90	861:69	853:96	844:81	834:59	822:89	813:85
8	8	67.80	010	869.16	868.89	868106	865.67	864131	859.55	853.52	846.12	837.40	827.50	816.52	807.09
9	9	69.80	010	857:84	857:53	856159	854.19	852193	848:44	842:76	835:78	827:62	818:35	808:05	799:19
10	10	71.80	010	844:25	843:91	842:88	840:58	839:46	835:39	830:12	823:78	816:17	807:62	798:13	789:97
11	11	72.60	010	844:26	843:92	842:89	840:68	839:48	835:41	830:15	823:72	816:20	807:65	798:16	790:01
12	12	74.31	010	845:97	845:62	844160	842.29	841113	837:86	831:76	825:42	818:85	809:72	800:52	792:66
13	13	74.51	010	845.96	845.59	844158	842.27	841111	836.97	831.74	825.42	818.07	809.77	800.62	792.80
14	14	74.81	010	845.85	845.51	844151	842.20	841103	836.89	831.67	825.38	818.06	809.81	800.72	792.96
15	15	75.51	010	845.59	845.25	844127	841.96	840178	836.65	831.45	825.20	817.95	809.79	800.80	793.15
16	16	75.41	010	845.52	845.19	844121	841.90	840172	836.59	831.39	825.15	817.92	809.77	800.80	793.17
17	17	75.71	010	845.30	844.97	844100	841.69	840151	836.38	831.20	824.99	817.79	809.69	800.79	793.23
18	18	76.11	010	844.97	844.66	843167	841.36	840119	836.06	830.91	824.73	817.58	809.55	800.75	793.26
19	19	76.51	010	844.59	844.27	843130	841.00	839182	835.71	830.58	824.43	817.34	809.37	800.64	793.26
20	20	76.61	010	844.50	844.17	843121	840.90	839173	835.62	830.49	824.36	817.27	809.32	800.61	793.25
21	21	76.91	010	844.19	843.87	842191	840.61	839144	835.33	830.22	824.11	817.07	809.16	800.51	793.21
22	22	77.31	010	843.77	843.45	842149	840.20	839103	834.94	829.85	823.78	816.77	808.93	800.36	793.15
23	23	77.61	010	843.45	843.13	842117	839.88	838171	834.64	829.57	823.51	816.55	808.75	800.23	793.08
24	24	77.71	010	843.34	843.02	842106	839.77	838161	834.56	829.47	823.43	816.47	808.69	800.19	793.06
25	25	77.81	010	843.24	842.91	841195	839.67	838150	834.46	829.37	823.36	816.39	808.62	800.14	793.03
26	26	78.11	010	842.91	842.59	841163	839.35	838119	834.13	829.09	823.07	816.16	808.43	800.00	792.95
27	27	78.51	010	842.48	842.16	841121	838.93	837177	833.73	828.71	822.72	815.85	808.17	799.80	792.82
28	28	78.61	010	842.38	842.06	841110	838.82	837167	833.63	828.61	822.64	815.77	808.10	799.75	792.78
29	29	78.81	010	842.17	841.85	840189	838.62	837147	833.44	828.43	822.46	815.61	807.97	799.65	792.71
30	30	78.91	010	842.06	841.74	840179	838.52	837137	833.34	828.34	822.38	815.54	807.90	799.60	792.68
31	31	79.31	010	841.66	841.34	840139	838.12	836198	832.97	827.98	822.05	815.24	807.66	799.39	792.53
32	32	79.61	010	841.37	841.05	840110	837.84	836170	832.69	827.72	821.80	815.02	807.45	799.23	792.41
33	33	79.70	010	841.28	840.96	840101	837.75	836161	832.61	827.64	821.73	814.95	807.39	799.18	792.37
34	34	79.80	010	841.19	840.87	839192	837.66	836152	832.52	827.56	821.65	814.88	807.33	799.13	792.33
35	35	80.10	010	840.92	840.60	839165	837.40	836126	832.27	827.32	821.43	814.67	807.14	798.97	792.20
36	36	80.50	010	840.59	840.28	839133	837.08	835194	831.97	827.03	821.15	814.41	806.91	798.77	792.03
37	37	80.80	010	840.37	840.05	839110	836.86	835173	831.76	826.82	820.96	814.23	806.74	798.62	791.90
38	38	81.20	010	840:19	839:78	838184	836:68	835147	831:58	826:58	820:72	814:01	806:53	798:43	791:73
39	39	81.40	010	629:75	629:71	629:64	629:51	629:44	629:22	628:93	628:59	628:28	627:79	627:39	627:13
40	40	81.70	010	629:72	629:78	629:64	629:58	629:44	629:22	628:93	628:58	628:28	627:79	627:38	627:12
41	41	82.20	010	629.69	629.67	629.60	629.47	629.40	629.18	628.89	628.55	628.16	627.75	627.34	627.07
42	42	82.50	010	629.65	629.63	629.57	629.43	629.37	629.14	628.85	628.51	628.12	627.71	627.30	627.01
43	43	82.70	010	629.62	629.60	629.54	629.40	629.34	629.11	628.83	628.48	628.09	627.68	627.26	626.97
44	44	83.00	010	629.57	629.55	629.49	629.36	629.29	629.07	628.78	628.44	628.05	627.63	627.20	626.90
45	45	83.20	010	629.54	629.52	629.46	629.33	629.26	629.04	628.75	628.40	628.01	627.59	627.16	626.85
46	46	83.70	010	629.45	629.43	629.37	629.24	629.18	628.95	628.66	628.32	627.92	627.50	627.05	626.71
47	47	84.20	010	629.37	629.35	629.29	629.15	629.09	628.86	628.57	628.23	627.83	627.40	626.94	626.55
48	48	84.50	010	629.31	629.29	629.23	629.10	629.04	628.81	628.52	628.18	627.78	627.34	626.86	626.46
49	49	84.70	010	629.28	629.26	629.20	629.07	629.00	628.78	628.49	628.14	627.74	627.30	626.82	626.40
50	50	85.20	010	629.20	629.18	629.12	628.99	628.92	628.70	628.41	628.06	627.66	627.21	626.70	626.25
51	51	85.50	010	629.15	629.13	629.07	628.94	628.88	628.65	628.36	628.01	627.61	627.15	626.64	626.16
52	52	85.70	010	629.13	629.10	629.04	628.91	628.85	628.62	628.33	627.98	627.57	627.12	626.60	626.11
53	53	86.20	010	629:86	629:84	628:98	628:84	628:78	628:55	628:26	627:90	627:50	627:03	626:59	625:98

54	54	86.40	018----	629:04---	629:02---	628:96---	628:83---	628:76---	628:53---	628:24---	627:89---	627:48---	627:01---	626:48---	625:96
55	55	88.99	018----	623:10---	623:07---	622198---	622:78---	622168---	622:31---	621:82---	621:19---	620:38---	619:34---	617:95---	616:44
56	56	91.78	010	616.91	616.87	616175	616.49	616136	615.88	615.22	614.36	613.26	611.85	610.03	608.18
57	57	94.57	010	611.11	611.07	610194	610.63	610148	609.93	609.18	608.21	606.98	605.45	603.55	601.73
58	58	97.36	010	605.86	605.81	605167	605.35	605120	604.62	603.84	602.85	601.62	600.12	598.32	596.65
59	59	100.14	010	601.21	601.17	601103	600.71	600156	599.99	599.24	598.29	597.12	595.73	594.10	592.63
60	60	102.93	010	597.19	597.14	597101	596.71	596157	596.03	595.33	594.45	593.39	592.14	590.70	589.43
61	61	105.72	010	593.75	593.71	593158	593.31	593118	592.69	592.05	591.26	590.32	589.22	587.97	586.88
62	62	108.51	010	590.85	590.82	590171	590.46	590134	589.91	589.34	588.64	587.82	586.86	585.79	584.86
63	63	111.30	010	588.45	588.42	588132	588.10	588100	587.62	587.12	586.51	585.79	584.97	584.06	583.26
64	64	113.97	010	586.56	586.53	586144	586.25	586116	585.82	585.39	584.86	584.24	583.53	582.74	582.06
65	65	116.65	010	585.02	584.99	584192	584.75	584167	584.37	584.00	583.53	583.00	582.39	581.71	581.13
66	66	119.32	010	583.79	583.76	583170	583.55	583148---	583:22---	582:89---	582:49---	582:03---	581:50---	580:91---	580:42
67	67	122.00	010	582.83	582.81	582175	582.62	582.56	582.34	582.04	581.69	581.28	580.82	580.32	579.89
68	68	124.75	010	582.10	582.08	582103	581.91	581186---	581:66---	581:40---	581:09---	580:73---	580:32---	579:88---	579:58
69	69	127.50	010	581.59	581.58	581153	581.43	581138	581.19	580.96	580.67	580.35	579.98	579.59	579.25
70	70	130.25	018----	581:38---	581:29---	581124	581.14	581109---	580:92---	580:70---	580:43---	580:13---	579:79---	579:42---	579:12
71	71	133.00	018----	581:28---	581:19---	581:15---	581:05---	581:00---	580:83---	580:62---	580:36---	580:06---	579:73---	579:37---	579:07

HEATING6 02/12/83 DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87 IBM3033/ 0

NSORNL1 18.18.18 01-07-88

STEADY STATE TEMPERATURE DISTRIBUTION AFTER 6721 ITERATIONS, TIME = 0.0

GROSS GRID			14	15	16	17	18	19	20	21	22	23	24	25	26
			I	I	I	I	I	I	I	I	I	I	I	I	I
FINE GRID			14	15	16	17	18	19	20	21	22	23	24	25	26
		DISTANCE	20.60	21.90	23.40	23.70	24.90	25.20	26.40	26.70	27.20	27.50	27.80	30.20	30.50
1	1	58.27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	2	59.40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	3	60.53	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	4	61.67	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	5	62.80	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	714.19
6	6	63.80	807.03	798.87	786.98	784.63	774.84	772.27	761.61	758.82	754.87	751.15	748.18	722.43	718.50
7	7	65.80	804.62	795.76	784.86	782.57	773.03	770.55	760.27	757.61	753.18	750.36	747.59	724.61	721.72
8	8	67.80	798.97	790.45	780.07	777.90	768.96	766.65	757.13	754.68	750.56	748.05	745.53	724.85	722.24
9	9	69.80	791.57	783.59	773.93	771.94	763.74	761.63	753.01	750.80	747.18	744.85	742.59	724.14	721.81
10	10	71.80	782.97	775.64	766.81	765.00	757.61	755.73	748.07	746.12	742.86	740.89	738.91	722.75	720.71
11	11	72.60	783.80	775.68	766.86	765.06	757.66	755.77	748.12	746.18	742.91	740.94	738.96	722.81	720.77
12	12	74.31	785.95	778.95	770.55	768.83	761.78	759.97	752.60	750.72	747.54	745.61	743.67	727.80	725.79
13	13	74.51	786.12	779.18	770.84	769.13	762.13	760.34	753.01	751.13	747.97	746.05	744.12	728.29	726.29
14	14	74.81	786.35	779.48	771.24	769.54	762.63	760.85	753.59	751.73	748.59	746.68	744.76	729.00	727.01
15	15	75.31	786.65	779.90	771.83	770.17	763.40	761.66	754.52	752.68	749.58	747.69	745.78	730.14	728.16
16	16	75.41	786.69	779.97	771.94	770.29	763.56	761.81	754.70	752.87	749.77	747.88	745.98	730.36	728.39
17	17	75.71	786.81	780.18	772.25	770.62	763.98	762.27	755.23	753.42	750.36	748.46	746.57	731.01	729.04
18	18	76.11	786.94	780.41	772.63	771.04	764.53	762.85	755.94	754.14	751.08	749.22	747.33	731.85	729.89
19	19	76.51	787.02	780.60	772.98	771.43	765.07	763.43	756.65	754.87	751.83	749.97	748.09	732.68	730.69
20	20	76.61	787.04	780.65	773.07	771.52	765.20	763.57	756.83	755.06	752.02	750.16	748.27	732.89	730.89
21	21	76.91	787.07	780.76	773.31	771.79	765.60	764.01	757.38	755.62	752.39	750.72	748.83	733.51	731.47
22	22	77.31	787.09	780.90	773.62	772.14	766.14	764.59	758.16	756.42	753.39	751.49	749.55	734.38	732.26
23	23	77.61	787.09	780.98	773.83	772.38	766.54	765.03	758.79	757.07	754.05	752.10	750.07	735.07	733.06
24	24	77.71	787.08	781.00	773.90	772.46	766.67	765.18	759.00	757.31	754.29	752.31	750.24	735.31	733.52
25	25	77.81	787.08	781.03	773.96	772.54	766.80	765.33	759.23	757.55	754.54	752.54	750.40	735.54	734.42
26	26	78.11	787.06	781.08	774.16	772.77	767.20	765.78	759.93	758.32	755.40	753.29	750.83	736.13	735.67
27	27	78.51	787.01	781.14	774.39	773.05	767.73	766.39	760.95	759.50	756.94	754.85	751.18	736.43	736.08
28	28	78.61	786.99	781.15	774.44	773.12	767.86	766.54	761.21	759.81	757.45	756.09	0.0	631.66	631.66
29	29	78.81	786.96	781.16	774.54	773.24	768.12	766.84	761.73	760.42	758.44	757.72	0.0	631.65	631.66
30	30	78.91	786.94	781.17	774.59	773.30	768.24	766.99	761.99	760.71	758.87	758.33	0.0	631.64	631.65
31	31	79.31	786.85	781.17	774.75	773.52	768.72	767.57	763.03	761.72	760.10	759.73	0.0	631.59	631.60
32	32	79.61	786.77	781.15	774.85	773.64	769.05	767.98	763.89	762.18	760.48	760.11	0.0	631.49	631.54
33	33	79.70	786.75	781.14	774.87	773.68	769.16	768.10	764.22	762.22	760.49	768.11	0.0	631.44	631.51
34	34	79.80	786.72	781.13	774.89	773.71	769.24	768.22	764.64	0.0	630.52	630.53	630.57	631.37	631.49
35	35	80.10	786.62	781.09	774.93	773.78	769.49	768.56	765.65	0.0	630.51	630.52	630.57	631.35	631.45
36	36	80.50	786.49	781.00	774.94	773.82	769.70	768.87	766.48	0.0	630.43	630.45	630.51	631.27	631.37
37	37	80.80	786.38	780.91	774.90	773.79	769.77	768.97	766.81	0.0	630.32	630.35	630.44	631.19	631.22
38	38	81.20	786.22	780.77	774.79	773.69	769.71	768.94	766.87	0.0	630.08	630.16	630.32	631.10	631.12
39	39	81.40	627.01	627.04	627.34	627.44	627.98	628.15	628.99	629.27	629.86	630.05	630.27	631.07	631.08
40	40	81.70	627.00	627.03	627.33	627.43	627.97	628.14	628.97	629.25	629.73	629.95	630.19	631.03	631.04
41	41	82.20	626.93	626.94	627.23	627.33	627.87	628.04	628.83	629.10	629.53	629.76	630.12	631.00	631.01
42	42	82.50	626.87	626.86	627.14	627.24	627.78	627.94	628.68	629.01	629.41	629.52	593.34	587.58	586.60
43	43	82.70	626.81	626.79	627.07	627.17	627.71	627.87	628.55	628.98	629.39	629.48	593.37	587.58	586.64
44	44	83.00	626.72	626.68	626.94	627.04	627.60	627.75	628.29	595.12	594.78	594.29	593.55	587.63	586.75
45	45	83.20	626.65	626.59	626.84	626.95	627.51	627.66	628.15	595.16	594.81	594.34	593.72	587.67	586.83
46	46	83.70	626.47	626.34	626.55	626.67	627.28	627.47	627.92	595.69	595.27	594.78	594.18	587.82	587.01
47	47	84.20	626.26	626.04	626.19	626.33	627.01	627.35	627.86	597.01	596.19	595.51	594.77	587.99	587.17
48	48	84.50	626.12	625.84	625.92	626.11	626.76	604.76	600.77	598.57	596.92	596.03	595.16	588.09	587.25
49	49	84.70	626.03	625.69	625.70	625.97	626.64	604.86	600.87	599.26	597.37	596.38	595.43	588.15	587.29
50	50	85.20	625.81	625.29	624.97	625.69	626.51	606.08	601.63	600.33	598.31	597.18	596.09	588.30	587.40
51	51	85.50	625.68	625.06	624.17	617.19	610.59	607.56	602.21	600.89	598.80	597.61	596.46	588.38	587.45
52	52	85.70	625.59	624.87	623.60	617.37	610.71	608.39	602.59	601.24	599.10	597.88	596.70	588.43	587.47
53	53	86.20	625.41	624.50	621.96	619.46	611.59	609.81	603.58	602.07	599.80	598.50	597.24	588.52	587.52

54	54	86.40	--625:38---	624:45---	621:75---	619:46---	611:59---	609:81---	603:58---	602:07---	599:80---	598:50---	597:24---	588:52---	587:52
55	55	88.99	--614:80---	612:59---	609:80---	608:10---	604:05---	603:01---	598:82---	597:79---	596:10---	595:10---	594:11---	586:63---	585:74
56	56	91.78	606.35	604.16	601.16	600.50	597.69	596.97	593.96	593.20	591.93	591.17	590.41	584.36	583.61
57	57	94.57	600.02	598.10	595.62	595.09	592.90	592.33	590.00	589.41	588.41	587.81	587.21	582.33	581.73
58	58	97.36	595.15	593.50	591.43	591.00	589.22	588.76	586.89	586.41	585.61	585.13	584.64	580.70	580.21
59	59	100.14	591.33	589.93	588.20	587.85	586.38	586.00	584.47	584.08	583.43	583.04	582.64	579.43	579.03
60	60	102.93	588.32	587.13	585.69	585.39	584.17	583.86	582.60	582.28	581.75	581.43	581.10	578.48	578.15
61	61	105.72	585.94	584.94	583.73	583.48	582.46	582.21	581.16	580.90	580.46	580.19	579.93	577.77	577.50
62	62	108.51	584.06	583.21	582.20	581.99	581.14	580.93	580.06	579.84	579.48	579.26	579.03	577.25	577.03
63	63	111.30	582.58	581.87	581.02	580.84	580.14	579.96	579.23	579.05	578.74	578.56	578.37	576.89	576.70
64	64	113.97	581.48	580.88	580.15	580.01	579.41	579.26	578.64	578.49	578.23	578.08	577.92	576.66	576.51
65	65	116.65	580.63	580.12	579.50	579.38	578.87	578.74	578.22	578.09	577.87	577.74	577.61	576.55	576.42
66	66	119.32	--579:99---	579:55---	579:03---	578:92---	578:49---	578:38---	577:94---	577:83---	577:65---	577:54---	577:43---	576:53---	576:42
67	67	122.00	579.52	579.15	578.70	578.61	578.24	578.15	577.78	577.68	577.53	577.44	577.34	576.59	576.49
68	68	124.75	--579:19---	578:86---	578:48---	578:40---	578:09---	578:02---	577:70---	577:62---	577:49---	577:42---	577:34---	576:71---	576:64
69	69	127.50	578.97	578.69	578.36	578.29	578.03	577.96	577.70	577.63	577.52	577146---	577:39---	576:88---	576:81
70	70	130.25	--578:86---	578:60---	578:31---	578:25---	578:02---	577:96---	577:74---	577:68---	577:59---	577154	577.49	577.10	577185
71	71	133.00	--578:83---	578:58---	578:30---	578:24---	578:03---	577:97---	577:78---	577:73---	577:66---	577:61---	577:57---	577:34---	577133

HEATING6 02/12/83 DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87 IBM3033/ 0
MNORMLT 18.18.18 01-07-88

STEADY STATE TEMPERATURE DISTRIBUTION AFTER 6721 ITERATIONS, TIME = 0.0

GROSS GRID			27	28	29	30	31	32	33	34	35	36	37	38	39
			I	I	I	I	I	I	I	I	I	I	I	I	I
FINE GRID			27	28	29	30	31	32	33	34	35	36	37	38	39
		DISTANCE	30.80	33.20	33.50	33.80	33.30	35.60	35.90	37.41	37.71	38.01	38.27	38.57	38.87
1	1	58.27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	619194	619.83
2	2	59.40	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	620199	620.80
3	3	60.53	0.0	0.0	0.0	0.0	0.0	646144	646.20	638.39	635.89	633.86	630.31	626170	624.79
4	4	61.67	0.0	0.0	0.0	0.0	0.0	649122	648.90	640.36	638105	635.65	633.47	630191	628.39
5	5	62.80	693.75	695.23	689.94	656.68	666.26	668129	657.38	644.66	642105	639.41	637.11	634166	631.76
6	6	63.80	715.86	693.76	690150	687.38	669.76	666.32	663.04	648.51	645169	642.87	640.45	637165	634.85
7	7	65.80	718.85	696.35	693140	690.44	675.42	672.47	669.52	655.11	652.25	649.40	646.93	644108	641.22
8	8	67.80	719.62	698.68	696.02	693.35	679.93	677.26	676.58	661.21	658.53	655.84	653.51	650180	648.07
9	9	69.80	719.47	700.67	698.39	695.94	684.88	681.72	679.36	667.56	665.17	662.88	660.74	658135	655.93
10	10	71.80	718.66	702.22	700.17	698.13	687.91	685.70	683.99	674.02	672.13	670.26	668.69	666193	665.27
11	11	72.60	718.73	702.30	700.25	698.20	687.99	685.97	683.97	676.06	672.14	670.23	668.58	666.79	664.88
12	12	74.31	725.78	707.64	705.56	703.65	692.64	690.24	687.78	674.87	679197	665.70	660.94	655.06	648.48
13	13	74.51	724.28	708.23	706.15	704.05	693.32	690.85	688.27	675.89	674128	0.0	633126	633.44	634.89
14	14	74.81	725.02	709.10	707.03	704.95	694.42	691.83	689.99	677.19	676156	0.0	633107	633121	633.66
15	15	75.31	726.19	710.56	708.50	706.43	696.59	694102	689.83	678.98	677155	0.0	632114	632115	632.07
16	16	75.41	726.61	710.86	708.79	706.72	697.10	695152	0.0	631178	631.78	631.82	631195	631196	631.77
17	17	75.71	727.08	711.75	709.65	707.52	698.52	697194	0.0	631177	631177	631.75	631.71	631150	630.89
18	18	76.11	727.93	713.00	710.81	708.42	699.78	699145	0.0	631177	631175	631.67	631.52	631119	629194
19	19	76.51	728.71	714.36	712132	708.91	700.20	699189	0.0	631183	631180	631.72	631.65	631157	622178
20	20	76.61	728.90	714.72	713146	0.0	632199	632.09	632.07	631186	631181	631.74	631.67	631162	621126
21	21	76.91	729.40	715.70	715124	0.0	632110	632109	632.08	631.89	631186	631.78	631.74	631171	617109
22	22	77.31	729.95	716.56	716130	0.0	632111	632110	632.09	631.93	631189	631.81	631.77	631175	611161
23	23	77.61	730.19	716.83	716158	0.0	632112	632111	632.10	631.96	631195	600143	600.83	602.42	606150
24	24	77.71	730.21	716.84	716159	0.0	632112	632112	632.10	631.97	631196	600137	600.76	602127	605.39
25	25	77.81	0.0	632110	632.11	632.11	632113	632112	632.11	631.98	631197	600118	600.55	601195	604.40
26	26	78.11	0.0	632110	632110	632.12	632.13	632112	632.11	632.00	631199	598196	599.25	600128	601.78
27	27	78.51	0.0	632107	632108	632.11	632.14	632113	632.11	632.08	632100	595193	596.35	597129	598.38
28	28	78.61	631.69	632105	632108	632.11	632.14	632113	0.0	0.0	0.0	594186	595.49	596149	597.54
29	29	78.81	631.69	632.04	632107	632.10	632.14	632114	584133	587.19	589.98	592114	593.67	594187	595.88
30	30	78.91	631.69	632.04	632107	632.10	632.14	632114	584131	587.16	588192	591.37	592.87	594108	595.07
31	31	79.31	631.66	632.02	632105	632.09	632.14	632114	583196	586.59	587181	589.18	590.22	591121	592.01
32	32	79.61	631.63	632.00	632101	581197	582.23	582.64	583143	585.87	586176	587.72	588.49	589125	589.87
33	33	79.70	631.62	632.00	632101	581197	582.21	582161	583.26	585.61	586141	587.26	587.95	588164	589.20
34	34	79.80	631.60	631.99	632100	581195	582.18	582156	583.10	585.33	586.05	586.80	587.42	588104	588.54
35	35	80.10	631.58	631.98	631198	581189	582.02	582128	582.62	584.41	584.91	585.43	585.85	586127	586.60
36	36	80.50	631.55	631.97	631198	581175	581.66	581179	581.96	583.10	583.38	583.66	583.87	584106	584.19
37	37	80.80	584143	582.89	581.79	581166	581.33	581137	581.46	582.08	582.22	582.35	582.43	582168	582.46
38	38	81.20	584149	581.95	581.71	581.50	580.81	580175	580.70	580.71	580.69	580.65	580.58	580146	580.29
39	39	81.40	584151	581.91	581.65	581.41	580.53	580142	580.32	580.03	579.96	579.82	579.69	579150	579.24
40	40	81.70	584165	581.83	581153	581.26	580.89	579191	579.74	579.02	578.82	578.60	578.38	578109	577.74
41	41	82.20	585105	581.67	581129	580.92	579.32	579.03	578.74	577.36	577.02	576.66	576.31	575187	575.38
42	42	82.50	585142	581.55	581112	580.71	578.84	578.49	578.14	576.40	575.98	575.53	575.12	574160	574.04
43	43	82.70	585.63	581.46	581101	580.56	578.52	578.13	577.74	575.76	575.30	574.81	574.35	573179	573.18
44	44	83.00	585.88	581.32	580.82	580.33	578.03	577.59	577.14	574.84	574.31	573.75	573.23	572161	571.93
45	45	83.20	586.00	581.22	580.69	580.16	577.71	577.22	576.74	574.23	573.66	573.06	572.51	571186	571.13
46	46	83.70	586.21	580.96	580.34	579.74	576.90	576.32	575.75	572.77	572.11	571.41	570.79	570103	569.23
47	47	84.20	586.36	580.63	579.96	579.30	576.09	575.46	574.79	571.39	570.64	569.86	569.17	568133	567.46
48	48	84.50	586.42	580.44	579.73	579.03	575.61	574.92	574.22	570.60	569.80	568.98	568.25	567137	566.45
49	49	84.70	586.45	580.30	579.57	578.85	575.30	574.58	573.85	570.08	569.26	568.41	567.65	566175	565.81
50	50	85.20	586.51	579.96	579.17	578.39	574.53	573.74	572.95	568.83	567.97	567.06	566.25	565128	564.28
51	51	85.50	586.53	579.75	578.93	578.12	574.08	573.26	572.43	568.15	567.23	566.29	565.45	564146	563.42
52	52	85.70	586.54	579.61	578.77	577.93	573.78	572.94	572.09	567.69	566.75	565.80	564.94	563193	562.88
53	53	86.20	586.54	579.25	578.37	577.48	573.06	572.17	571.26	566.68	565.62	564.63	563.75	562.71	561.66

54	54	86.40	--586:54	---579:25	---578:36	---577:48	---573:06	---572:16	---571:26	---566:59	---565:61	---564:62	---563:74	---562:71	---561:66
55	55	88.99	--584:86	---578:11	---577:28	---576:45	---572:33	---571:58	---570:67	---566:48	---565:63	---564:77	---564:02	---563:16	---562:29
56	56	91.78	582.88	577.08	576.36	575.65	572.11	571.40	570.70	567.20	566.50	565.81	565.21	564.52	563.83
57	57	94.57	581.12	576.32	575.72	575.13	572.20	571.63	571.05	568.21	567.66	567.11	566.63	566.09	565.55
58	58	97.36	579.71	575.79	575.31	574.83	572.44	571.98	571.52	569.24	568.80	568.37	567.99	567.56	567.14
59	59	100.14	578.63	575.44	575.05	574.66	572.74	572.36	571.99	570.17	569.82	569.47	569.17	568.86	568.50
60	60	102.93	577.83	575.22	574.91	574.59	573.03	572.73	572.43	570.96	570.67	570.39	570.16	569.89	569.62
61	61	105.72	577.23	575.10	574.84	574.58	573.31	573.06	572.81	571.61	571.38	571.15	570.96	570.74	570.52
62	62	108.51	576.81	575.05	574.83	574.62	573.56	573.36	573.15	572.16	571.97	571.78	571.62	571.43	571.25
63	63	111.30	576.52	575.05	574.87	574.69	573.81	573.64	573.47	572.63	572.46	572.30	572.17	572.01	571.85
64	64	113.97	576.35	575.11	574.96	574.81	574.05	573.90	573.76	573.03	572.89	572.75	572.63	572.49	572.36
65	65	116.65	576.28	575.23	575.10	574.97	574.32	574.19	574.06	573.43	573.30	573.18	573.07	572.95	572.82
66	66	119.32	--576:30	---575:41	---575:38	---575:19	---574:63	---574:52	---574:41	---573:85	---573:73	---573:62	---573:52	---573:41	---573:29
67	67	122.00	576.40	575.65	575.56	575.47	575.01	574.91	574.82	574.35	574.25	574.15	574.06	573.96	573.86
68	68	124.75	--576:56	---575:95	---575188	575.81	575.46	575.40	575.33	575.02	574196	---574:86	---574:79	---574:72	---574:67
69	69	127.50	--576:75	---576:24	---576119	576.13	575.89	575185	---575:77	---575:55	---575154	0.0	0.0	0.0	0.0
70	70	130.25	--576:96	---576:42	---576:37	---576:33	---576:28	---576120	0.0	0.0	0.0	0.0	0.0	0.0	0.0
71	71	133.00	----0:0	------0:0	------0:0	------0:0	------0:0	------0:0	------0:0	------0:0	------0:0	------0:0	------0:0	------0:0	------0:0-

HEATING6 02/12/83 DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87 IBM3033/ 0
NSORML1 18.18.18 01-07-88

STEADY STATE TEMPERATURE DISTRIBUTION AFTER 6721 ITERATIONS, TIME = 0.0

GROSS GRID			40	41	42	43	44	45	46	47
			I	I	I	I	I	I	I	I
FINE GRID			40	41	42	43	44	45	46	47
		DISTANCE	39.23	39.43	42.52	45.60	48.69	51.25	53.80	56.36
1	1	58.27	--619143	---619148	-----0:0	------0:0	------0:0	------0:0	------0:0	------010
2	2	59.40	620121	620118	0.0	0.0	0.0	0.0	0.0	010
3	3	60.53	622148	622143	0.0	0.0	0.0	0.0	0.0	010
4	4	61.67	625136	625131	0.0	0.0	0.0	0.0	0.0	010
5	5	62.80	628152	628146	0.0	0.0	0.0	0.0	0.0	010
6	6	63.80	631146	631140	0.0	0.0	0.0	0.0	0.0	010
7	7	65.80	637176	637170	0.0	0.0	0.0	0.0	0.0	010
8	8	67.80	644176	644170	0.0	0.0	0.0	0.0	0.0	010
9	9	69.80	652199	652192	0.0	0.0	0.0	0.0	0.0	010
10	10	71.80	--663149	663132	0.0	0.0	0.0	0.0	0.0	010
11	11	72.60	--662146	662119	0.0	0.0	0.0	0.0	0.0	010
12	12	74.31	--639137	639129	0.0	0.0	0.0	0.0	0.0	010
13	13	74.51	--635149	636149	0.0	0.0	0.0	0.0	0.0	010
14	14	74.81	--634136	634139	0.0	0.0	0.0	0.0	0.0	010
15	15	75.31	631193	631187	0.0	0.0	0.0	0.0	0.0	010
16	16	75.41	631145	631137	0.0	0.0	0.0	0.0	0.0	010
17	17	75.71	629197	629182	0.0	0.0	0.0	0.0	0.0	010
18	18	76.11	--627148	627112	0.0	0.0	0.0	0.0	0.0	010
19	19	76.51	622110	622104	0.0	0.0	0.0	0.0	0.0	010
20	20	76.61	620181	620177	0.0	0.0	0.0	0.0	0.0	010
21	21	76.91	617105	617102	0.0	0.0	0.0	0.0	0.0	010
22	22	77.31	612123	612120	0.0	0.0	0.0	0.0	0.0	010
23	23	77.61	608178	608177	0.0	0.0	0.0	0.0	0.0	010
24	24	77.71	--607168	607167	0.0	0.0	0.0	0.0	0.0	010
25	25	77.81	606160	606159	0.0	0.0	0.0	0.0	0.0	010
26	26	78.11	603150	603148	0.0	0.0	0.0	0.0	0.0	010
27	27	78.51	599166	599162	0.0	0.0	0.0	0.0	0.0	010
28	28	78.61	598172	598170	0.0	0.0	0.0	0.0	0.0	010
29	29	78.81	596193	596192	0.0	0.0	0.0	0.0	0.0	010
30	30	78.91	596106	596105	0.0	0.0	0.0	0.0	0.0	010
31	31	79.31	592177	592175	0.0	0.0	0.0	0.0	0.0	010
32	32	79.61	590144	590142	0.0	0.0	0.0	0.0	0.0	010
33	33	79.70	589171	589169	0.0	0.0	0.0	0.0	0.0	010
34	34	79.80	588199	588197	0.0	0.0	0.0	0.0	0.0	010
35	35	80.10	586186	586184	0.0	0.0	0.0	0.0	0.0	010
36	36	80.50	584122	584119	0.0	0.0	0.0	0.0	0.0	010
37	37	80.80	582134	582131	0.0	0.0	0.0	0.0	0.0	010
38	38	81.20	579198	579195	0.0	0.0	0.0	0.0	0.0	010
39	39	81.40	578185	578183	0.0	0.0	0.0	0.0	0.0	010
40	40	81.70	577124	577121	0.0	0.0	0.0	0.0	0.0	010
41	41	82.20	574171	574169	0.0	0.0	0.0	0.0	0.0	010
42	42	82.50	573129	573126	0.0	0.0	0.0	0.0	0.0	010
43	43	82.70	572138	572135	0.0	0.0	0.0	0.0	0.0	010
44	44	83.00	571106	571103	0.0	0.0	0.0	0.0	0.0	010
45	45	83.20	570122	570119	0.0	0.0	0.0	0.0	0.0	010
46	46	83.70	568121	568119	0.0	0.0	0.0	0.0	0.0	010
47	47	84.20	566136	566133	0.0	0.0	0.0	0.0	0.0	010
48	48	84.50	565130	565127	0.0	0.0	0.0	0.0	0.0	010
49	49	84.70	564163	564160	0.0	0.0	0.0	0.0	0.0	010
50	50	85.20	563102	562199	0.0	0.0	0.0	0.0	0.0	010
51	51	85.50	562111	562108	0.0	0.0	0.0	0.0	0.0	010
52	52	85.70	--561153	561148	0.0	0.0	0.0	0.0	0.0	010
53	53	86.20	--560132	559188	---545:90	---537:07	---531194	0.0	0.0	010

54	54	86.40	--560:48	---559:85	---545:93	---537:89	---531195	0.0	0.0	010	
55	55	88.99	--561:24	---560:65	---551:15	---543135	---535166	---533130	0.0	010	
56	56	91.78	563.01	562.55	555.65	549190	---545158	544141	0.0	010	
57	57	94.57	564.91	564.56	559.41	555.32	552174	552123	0.0	010	
58	58	97.36	566.64	566.37	562.47	559.55	558109	558161	---560106	010	
59	59	100.14	568.11	567.89	564.87	562.65	561148	---561138	561164	010	
60	60	102.93	569.30	569.13	566.72	564.94	563.92	563163	563165	010	
61	61	105.72	570.26	570.12	568.14	566.66	565.75	565145	565164	---566108	
62	62	108.51	571.03	570.92	569.25	567.95	567.07	566166	---566152	566156	
63	63	111.30	571.67	571.57	570.12	568.95	568187	---567:53	---567116	567106	
64	64	113.97	572.20	572.11	570.81	569173	---568183	568118	---567:46	---567127	
65	65	116.65	572.68	572.60	571139	---570139	569153	---568189	0.0	010	
66	66	119.32	--573:16	---573:08	---571187	570198	---570115	0.0	0.0	010	
67	67	122.00	573.73	573165	---572:16	---571148	0.0	0.0	0.0	010	
68	68	124.75	--574:64	---574163	0.0	0.0	0.0	0.0	0.0	010	
69	69	127.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	010	
70	70	130.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	010	
71	71	133.00	----0:0	------0:0	------0:0	------0:0	------0:0	------0:0	------0:0	------010	

TEMPERATURES ON NUMBERED BOUNDARIES

BOUNDARY NUMBER	TEMPERATURE
1	0.0
2	0.0
3	0.0

ELAPSED CPU TIME IS 1120.19 SECONDS

THE MAXIMUM TEMPERATURE IS - 8.80492D+02 (+-0.1 PERCENT)

MAX. TEMP. APPEARS AT NODES - 45 46

THE MINIMUM TEMPERATURE IS - 5.31939D+02 (+-0.1 PERCENT)

MIN. TEMP. APPEARS AT NODES - 1938 1981

```
THE STEADY STATE CALCULATIONS HAVE BEEN COMPLETED.

NUMBER OF ITERATIONS COMPLETED =  6721


***** CASE NUMBER    1
***** JOB DESCRIPTION ***** DOS-HEATING6 RUN FOR GE SPACE REACTOR (1984 MODEL);LSU,09/24/87
***** THE CALCULATIONS FOR THIS CASE HAVE BEEN COMPLETED.
***** NUMBER OF ERRORS ENCOUNTERED IN THE INPUT DATA FOR THIS CASE WAS --    0
***** AN ATTEMPT WILL BE MADE TO READ DATA FOR A NEW CASE.

***** THE CALCULATIONS USING THE HEATING6 CODE HAVE BEEN COMPLETED.
***** NUMBER OF CASES ENCOUNTERED IN THE INPUT DATA  --     1
***** NUMBER OF ERRORS ENCOUNTERED IN THE INPUT DATA --     0
```

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