NASA TECHNICAL MEMORANDUM

NASA TM X-2998

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USER'S GUIDE FOR ANALYSIS OF FINITE ELASTOPLASTIC DEFORMATION: THE FIPDEF AND FIPAX PROGRAMS FOR THE CDC 6600

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION • WASHINGTON, D. C. • JUNE 1974

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA TM X-2998		

4. Title and Subtitle	5. Report Date
USER'S GUIDE FOR ANALYSIS OF FINITE ELASTOPLASTIC DEFORMATION: THE FIPDEF AND FIPAX PROGRAMS FOR THE CDC 6600	June 1974
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Jon R. Osias	E-7610
	10. Work Unit No.
	501-21

9. Performing Organization Name and Address	11. Contract or Grant No.
Lewis Research Center National Aeronautics and Space Administration Cleveland, Ohio 44135	

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
National Aeronautics and Space Administration Washington, D.C. 20546	Technical Memorandum
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

The subject computer programs provide incremental finite-element analysis capability for problems of quasi-static, finite, elastoplastic deformation in two spatial dimensions (plane strain, plane stress, axisymmetric). Monotonic or cyclic loading of isotropic hardening materials may be considered. The only restriction on the form of the stress-strain curve is that the rate of work hardening exceed some small positive value. The user's guide assumes familiarity with both finite-element analysis and FORTRAN IV programming for the CDC 6600. Sufficient information is provided to support problem solving utilization of the programs.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Finite deformation CDC 6600 Plasticity Elastoplastic flow Finite elements	Unclassified - unlimited CAT. 32

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price*
Unclassified	Unclassified	74	$3.75

* For sale by the National Technical Information Service, Springfield, Virginia 22151

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SUMMARY

The FIPDEF and FIPAX programs provide analysis capability for problems of two-dimensional finite deformation of elastoplastic bodies. Applications are restricted to problems amenable to analysis in two spatial dimensions. Both programs, FIPDEF for problems of plane strain and plane stress, and FIPAX for axisymmetric cases, allow treatment of monotonic and cyclic loading of isotropic materials which exhibit no Bauschinger effect. Elastic unloading, as, for example, in tensile necking, is automatically treated. No restriction is placed upon deformation magnitude other than the availability of material property data. Stress - plastic strain data points are used directly, providing a piece-wise linear relation, thereby eliminating any need for curve fitting of experimental property data. The input data points must reflect a strictly positive rate of hardening.

The problem of finite elastoplastic deformation has been posed as a quasi-linear initial- and boundary-value problem (refs. 1 and 2). The subject programs perform requisite integrations of the governing equations over space and time. The analyses presume the existence of a stress-free reference configuration and require that it be modeled by an array of triangular finite elements. The initial geometry may include sharp notches. Complete problem definition requires specification of material property information, elastic constants and stress-strain data, and an incremental boundary condition history involving boundary loads and/or displacements.

The user's guide is intended to support problem solving utilization of the programs. Matters of theoretical formulation and numerical procedure are documented in references 1 to 3 and are not detailed here. Specification of problem input and output as well as sample problem input and output are provided. Summary information on program structure and auxiliary storage requirements is presented. The user is presumed to be familiar with the operational aspects of finite-element analysis as well as FORTRAN IV programming for the CDC 6600.

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INTRODUCTION

The FIPDEF (finite planar plastic deformation) and FIPAX (finite plastic axisymmetric deformation) computer programs perform incremental finite-element analysis of problems of elastoplastic deformation which admit modeling in two spatial dimensions. The deformation may be viewed as either infinitesimal or finite; that is, according to user specification, the analysis considers the undeformed and deformed configurations of a body to be either indistinguishable or distinct.

Should the deformation be considered finite, the numerical analysis is based on objective, complete forms of the incremental equilibrium and elastoplastic constitutive equations. Consequently the analysis is valid irrespective of deformation magnitude. This feature provides the principal distinction between the capabilities of the subject finite-element programs and other available formulations employing, for example, simple "updating" of nodel coordinates or "large" displacement - "small" strain kinematics appropriate to limited classes of plate and shell problems. The present analyses are considered appropriate for two-dimensional treatment of the finite deformation of bodies of arbitrary shape including those containing sharp notches.

The theoretical formulation and numerical procedures employed are detailed in references 1 to 3 and will not be reiterated here. It is appropriate, however, to review several aspects of the general finite-deformation formulation which have a direct bearing on definition and solution of particular problems.

The problem of finite elastoplastic deformation is posed in the form of an initial- and boundary-value problem whose spatial domain is at all times the current configuration of a deforming solid. The adoption of this Eulerian viewpoint produces a quasi-linear problem whose solution requires a sequence of spatial integrations of the instantaneously linear governing equations. Consecutive spatial integrations, accomplished by finite-element solution, are coupled by the integration of the dependent variables over a small increment of time. Thus, to the user, the numerical analysis appears as an incremental process producing the entire history of deformation, boundary loading, and internal stress and strain fields. In the limit of infinitesimal deformation, the formulation and numerical implementation reduce to a conventional incremental finite-element analysis of infinitesimal elastoplastic deformation.

The piecewise linear nature of the numerical analysis allows the solution of finite-deformation problems at no greater computational expense than is required for analysis of infinitesimal elastoplastic deformation. Furthermore, this feature allows efficient automatic treatment of elastic unloading and cyclic plasticity.

Problem definition requires specification of a finite-element map corresponding to the undeformed, stress-free state; material properties, elastic constants and equivalent stress - plastic-strain data; and an incremental boundary condition history involving boundary components of displacement, load, or admissible combinations thereof.

As deformation proceeds the finite-element map deforms providing a material reference frame for tracking stress and strain field components within the Eulerian framework of the analysis. Consequently incremental boundary condition specifications must reflect conditions applied to the deformed state at each increment.

Principal features of both programs include:

(a) User specification of either infinitesimal or finite deformation analysis

(b) Choice of either isotropic elastic or work-hardening elastoplastic material behavior

(c) Data point specification of the equivalent stress - plastic strain relation

(d) Automatic treatment of elastic unloading and cyclic plasticity

(e) Program control of incremental loading history in accordance with user specification of maximum allowable incremental stress magnitude

(f) Problem interruption and restart capability.

Additional options for both programs are defined in the input data tables of the sections dealing with the individual programs.

This user guide is divided into four sections dealing with details of program usage, including problem definition, specifics of utilization for each of the programs, and sample problem input and output. The program sections include information on input data, output data, program structure, and array dimensioning.

Before proceeding the user must be cautioned in several respects. These programs have been extensively verified and evaluated only for a limited class of displacement bounded problems of particular interest to the developer (see, e.g., refs. 1 and 2). The user is encouraged to undertake his own verification for those types of problem he intends to consider. It is assumed that the user is familiar with the operational aspects of finite-element analysis (ref. 4), FORTRAN IV programming, and the CDC SCOPE operating environment.

SYMBOLS

d^p_{ef} effective plastic strain rate,[1] $\equiv \left[(2/3)d^p_{ij}d^p_{ij}\right]^{1/2}$

d_{ij} deformation rate, $\equiv (1/2)\left(\partial v_i/\partial x^j + \partial v_j/\partial x^i\right)$

E Young's modulus (linear elastic)

F^N_i i^{th} component of load vector at node N

f_i i^{th} component of lineal boundary loading density

[1] Repeated index implies summation over $i, j = 1, 2, 3$.

J_i	i^{th} component of J integral
$\jmath_2$	second invariant of deviatoric stress, $\equiv (1/2)\, S_{ij}S_{ij}$
K	bulk modulus (linear elastic)
ℓ	deformed tensile test specimen gage length
ℓ_o	initial tensile test specimen gage length
R_N	radial coordinate of node N
r, z	cylindrical spatial coordinates
S_{ij}	deviatoric Cauchy stress
v_i	velocity field
$x_i (i=1,2,3)$	general spatial coordinates
x, y	Cartesian spatial coordinates
γ_o^p	octahedral plastic strain, $= \left(1/\sqrt{2}\right)\epsilon_{ef}^p$
ϵ_{ef}^p	effective plastic strain, $\equiv \int d_{ef}^p \, dt$
σ	uniaxial stress in simple tension
σ_{ef}	effective stress, $\equiv (3\jmath_2)^{1/2}$
τ_o	octahedral stress, $\left(\sqrt{2}/3\right)\sigma_{ef}$

PROGRAM USAGE

Problem Definition

This discussion is limited to those facets of problem definition unique to the present analysis of finite deformation. Additional program-dependent specifics of input and output are given in later sections.

Independent variables of the analysis include two spatial coordinates and "time." Spatial coordinates are defined in a single fixed reference frame throughout the solution of a given problem. Since application is limited to problems of quasi-static deformation of rate-insensitive elastoplastic materials, the entire analysis is independent of time scale. Thus "time" represents any parameter convenient as an ordering reference for the deformation process.

Geometry. - The geometry of a deforming body is always given by the instantaneous configuration of the finite-element map. The initial, stress-free configuration is specified by definition of an array of triangular elements, each defined by the positions of three vertex nodes. Nodal coordinates are defined in the fixed Cartesian (FIPDEF) or cylindrical (FIPAX) coordinate system of the analysis. Nodes are assigned numerical identification in the order of specification of their coordinates. Elements are numbered in the order of specification of triplets of node numbers, each triplet defining a single element. Within each triplet nodes must be specified in counterclockwise order around the element. As deformation proceeds, the element map is deformed by updating of the nodal coordinates.

Material properties. - Elastic and elastoplastic material properties must be supplied. Elastic properties required are the Young's modulus and Poisson's ratio of linear elasticity. It is assumed that stress levels considered are sufficiently low ($\sigma_{ij}/E << 1$) that the elastic portion of the deformation is adequately represented by linear elasticity. Incompressible elastic material behavior in plane strain or of axisymmetric bodies may be approximated by specification of a bulk modulus considerably greater than the Young's modulus ($K/E > 1000$) for the material. In plane stress such behavior is treated exactly by prescribing a Poisson's ratio of 0.5.

Plastic deformation is governed by a discrete input relation between an equivalent stress and an equivalent plastic strain. The relation is supplied in the form of data point pairs. Equivalent stress-strain data may be supplied in terms of either effective $\left(\sigma_{ef}, \epsilon^p_{ef}\right)$ or octahedral $\left(\tau_o, \gamma^p_o\right)$ quantities. Thus, if property data are available from uniaxial tensile testing, the stress-strain relation input data are found as

$$\sigma_{ef} = \frac{3}{\sqrt{2}}\ \tau_o = \sigma$$

$$\epsilon^p_{ef} = \sqrt{2}\ \gamma^p_o = \ln \frac{l}{l_o} - \frac{\sigma}{E}$$

The present formulation and numerical implementation are restricted to the consideration of work-hardening materials. The slope of the stress-plastic strain curve must be strictly positive.

Boundary conditions. - The principal unknowns of the analysis are nodal displacement and force vectors. Coordinate components of nodal vector quantities, position, displacement, and force are identified by index numbers derived from the node numbers. At node N the x_1 component of a vector quantity is indexed as number (2N - 1) and the x_2 component as (2N) in a matrix vector containing components at all nodes. In planar analysis (FIPDEF), $x_1 = x$ and $x_2 = y$; while in axisymmetric analysis, $x_1 = r$ and $x_2 = z$.

Boundary conditions are set by prescribing a sequence of incremental values for appropriate nodal forces and/or displacements. The default condition at all nodes is null valued force components. This condition is automatically removed at any node by specification of nonzero incremental force components or of incremental displacement components. All incremental nodal boundary values are applied to the instantaneous configuration of a deforming body. Nodal force components represent loads not tractions. Thus in a plane stress analysis where thinning is considered nodal force components are loads on present thickness not load per unit thickness; the initial thickness is assumed to be unity but subsequently may vary. In axisymmetric analysis nodal force components are of the form

$$F_i^N = 2\pi R_N f_i \qquad (i = 1, 2)$$

where R_N is the present radial coordinate of node N and f_i is a ring loading density. For further discussion of nodal force boundary conditions see references 1 and 2.

Incremental values of nodal force and displacement components may be specified individually for each increment (nonuniform conditions) or by providing a single value at each increment which is to be applied to a number of components (uniform conditions). Uniform and nonuniform boundary condition specification modes for displacements or for forces may not both be used in a single problem.

The total number of integration steps comprising a complete analysis is determined by two factors. The number of increments is user determined by the manner of boundary condition specification as discussed previously. Each increment may be divided into a number of smaller integration steps, or substeps, by invoking an "autoload" option that restricts element stress variation within any substep. The autoload option requires user specification of maximum values for yield stress overshoot (applied to both initial yield and secondary yielding in cyclic loading) and octahedral stress variation over any integration step. The programs will divide user prescribed increments into a number of substeps to insure compliance with these stress-variation tolerances. The user may thereby obtain controlled accuracy but loses precise control over the amount of computing required.

Restart Capability

Problems involving uniform displacement boundary conditions may be restarted at preselected integration steps of the analysis. After each such integration step a restart data block containing sufficient data for restart of the analysis is written into a user declared file. The user must specify the interval between integration steps from which restart data blocks are filed. Program response to the restart data interval specification

will involve counting of increments or of substeps as the autoload option is suppressed or activated. Restart data blocks filed for a particular problem are identified by number in their order of generation. A restarted problem may employ an additional number of uniform incremental boundary displacements and/or a revised or extended stress-strain curve.

The FIPDEF program allows restart data to be stored on either cards or tape files. The FIPAX program uses only tape.

Program Considerations

Program array dimensions are problem dependent and must be user specified by source code modification. Detailed requirements are given in sections discussing the FIPDEF and FIPAX programs.

If restart data blocks are to be written into or retrieved from tape files, the tape must be declared as logical file TAPE1.

ASCII formatting conventions (ref. 5) are employed and must be declared when the programs are compiled on the CDC RUN compiler.

THE FIPDEF PROGRAM

Analysis capability is provided for problems of planar deformation under conditions of either plane strain or plane stress. Either infinitesimal or finite-deformation analysis may be performed. Plane stress finite-deformation analysis may consider or neglect the effects of local thinning from an initial unit thickness. If thinning is considered, boundary force vectors are total loads on present thickness; if thinning is neglected, force vectors are to be interpreted as load per unit thickness.

Restart data blocks generated from intermediate integration steps may be stored on tape. A restart block from the final step of an analysis may be retained on either tape files or cards.

In the following sections information is provided on input/output data, program structure, and array variable minimum dimensions.

Input Data

In this section the complete FIPDEF input card stream for both initialization and restart problems is defined. Note that not all input cards defined will be present for a given problem.

CD	Format	Data
1	16(I4, 1x)	NINC: Number of loading increments. NINF: Deformation mode control. NINF = 1: full finite deformation analysis. = 2: thinning suppressed (valid only for NZZ = 1 (CD. 8)). = 3: infinitesimal deformation analysis. NOUTP: Output print interval (default value, 1). NPT: Input source key. NPT = 0: initial card input; no restart data to be generated. = 1: restart problem or initial problem card input with restart data to be generated. Note: NPT = 1 is admissible only for NDIS = 0 on CD. 8 and NFC = 0 on CD. 12. NPRNT: Increment number for initial output printing (default value, 1). NITER: Maximum allowed cyclic loading evaluation iterations (default value-no limit). INCP: Nodal data output control. INCP = 0: partial output. = 1: full output. (See output block 14.)

If NPT = 0, skip to CD. 7.

2	16(I4, 1x)	NPTR: Restart data control. NPTR = 1: restart data on tape. = 2: restart data on cards. = 3: initial problem from card data with restart data to be generated. NEXT: Restart problem extension key. NEXT = 0: no problem extension. = 1: initial problem extended by increasing the number of loading increments. Note: NEXT is ignored for NPTR = 3. NTBLK: Number of the restart block on file TAPE1 from which problem data is to be retrieved. NTMAX: Total number of restart record blocks on TAPE1.

CD	Format	Data
2	16(I4, 1x)	Notes: (a) Analysis will restart from block NTBLK and additional restart record blocks will be placed following block NTMAX. (b) NTBLK, NTMAX are ignored for NPTR = 2. NOUTR: Increment/substep interval for tape restart data generation (default is no data generation). NPTG: Final increment restart data generation control. For ISC = 0 (no "autoload," see CD. 27) - NPTG = 0: no restart card data produced. = 1: restart card data produced after the last substep of increment NINC. For ISC = 1 ("autoload" increment control, see CD. 27) - NPTG = 0: no restart data generation from last increment/substep analysis. = 1: restart data on TAPE1 and output print from last increment/substep analysis so long as NOUTR $\neq 0$ on CD. 2. NPROP: Restart problem stress-strain curve key. NPROP = 0: use original curve. = 1: new curve to be supplied.

If NPTR = 3, skip to CD. 7.
If NPTR = 2, the restart card block is placed here.
If NPTR = 1, 2 and NEXT = NPROP = 0, skip to CD. 27.
If NPTR = 1, 2, NEXT = 0, and NPROP = 1, skip to CD. 5.

3	I4	NINC: New maximum number of loading increments.
4	10F8. 1	TD(I): K1 $\leq$ I $\leq$ K2 (see CD. 14). K1 = first increment number of restarted problem. K2 = NINC on CD. 3.

If NPROP = 0, skip to CD. 27.

5	I4	NPSS: Number of data points on revised stress-strain curve (see CD. 22); NPSS $\geq$ 3.
6	2E20. 10	SS(I): 1 $\leq$ I $\leq$ 2 (NPSS). Stress-strain curve data point vector; one ordered pair (σ_{eq}, ϵ_q^p) per card; data may be either octahedral or effective (see CD. 22).

Skip to CD. 27.

CD	Format	Data
7	A1, 7A10	NCAR: Output carriage control character. TITLE: Alphanumeric, up to 70 characters.
8	16(I4, 1x)	IBD: Bandwidth = (2) ($\|N2 - N1\| + 1$) where $\|N2 - N1\|$ = maximum difference in numbers assigned to adjacent nodes. NRD: Number of degrees of freedom associated with complete problem before application of boundary conditions. NEL: Number of elements. NXY: Nodal coordinate input format key for CD. 10. NXY = 1: five nodal coordinate pairs per card. = 2: one nodal coordinate pair per card. NDIS: Incremental displacement boundary condition mode: NDIS = 0: uniform. = 1: nonuniform. NF: Incremental force boundary condition mode. NF = 0: uniform. = 1: nonuniform. NZZ: Planar analysis mode control. NZZ = 1: plane stress. = 2: plane strain.
9	8(3I3, 1x)	NM(I): $1 \leq I \leq 3$ (NEL); element definition, node identification in counterclockwise order around each element.
10	10F8.5	XYMO(I): $1 \leq I \leq$ NRD; nodal coordinates in (x, y) pairs (see NXY, CD. 8).
11	4E10.5	SFX: x-coordinate scale factor. SFY: y-coordinate scale factor. DX: x-coordinate shift after scaling. DY: y-coordinate shift after scaling.
12	16(I4, 1x)	NDC: Number of degrees of freedom eliminated by nonzero incremental displacement conditions. NZC: Number of degrees of freedom eliminated by zero incremental displacement conditions.

CD	Format	Data
12	16(I4, 1x)	NFC: Number of degrees of freedom eliminated by nonzero incremental force conditions. IDBC: Incremental nodal displacement boundary condition array input order (see CD. 15) (ignored for NDIS = 0 on CD. 8). IFBC: Incremental nodal force boundary condition array input order (see CD. 19) (ignored for NF = 0 on CD. 8). NNF: Number of boundary nodal force components included in boundary load summation (see CD. 23).

If NDC = 0, skip to CD. 16.

13	16(I4, 1x)	NDP(I): $1 \leq I \leq$ NDC; identification of boundary incremental nodal displacement components set to nonzero values.

If NDIS = 1, skip to CD. 15.

14	10F8. 1	TD(I): $1 \leq I \leq$ NINC; values of uniform incremental boundary nodal displacement.

If NDIS = 0, skip to CD. 16.

15	10F8. 1	DBC(I, J): $1 \leq I \leq$ NINC array (NINC rows, NDC columns) $1 \leq J \leq$ NDC Incremental displacement boundary condition value array. Input order is governed by IDBC (CD. 12) as IDBC = 0: input DBC by columns. = 1: input DBC by rows. Note: Values are assigned to particular boundary displacements in the order of specification of the NDP(I) on CD. 13; e.g., DBC(I, J) = incremental value assigned to displacement NDP(J) at increment I.
16	16(I4, 1x)	NZP(I): $1 \leq I \leq$ NZC; nodal incremental displacement components set to zero values for all increments.

If NFC = 0, skip to CD. 20.

17	16(I4, 1x)	NFP(I): $1 \leq I \leq$ NFC; identification of boundary nodal incremental force components set to nonzero values.

If NF = 1, skip to CD. 19.

18	10F8. 1	TF(I): $1 \leq I \leq$ NINC; values of uniform incremental boundary nodal forces.

CD	Format	Data

If NF = 0, skip to CD. 20.

19	10F8.1	FBC(I, J): Nonuniform boundary nodal incremental force boundary condition value array; defined analogously to DBC(I, J), CD. 15, in terms of NINC, NFC, IFBC, NFP.
20	3E20.8	PRT: Poisson's ratio, elastic. YMD: Young's modulus, elastic. RKAP: Bulk modulus, elastic. Note: In plane strain, for PRT < 0.5 the input value of RKAP is ignored and RKAP = YMD/[3(1 - 2PRT)] is used. In plane stress the input value of RKAP is ignored.
21	16(I4, 1x)	IPSS: Stress - plastic-strain data point pair input order key. IPSS = 0, = 1 } the input order is $\begin{cases}\sigma_{eq}, \epsilon^{p}_{eq} \\ \epsilon^{p}_{eq}, \sigma_{eq}\end{cases}$ NPSS: Number of stress - plastic-strain curve input points; NPSS ≥ 3. Note: If NPSS = 0, an elastic analysis will be performed; the maximum octahedral stress must be less than 10^{10} lb/in.^{2}.

If NPSS = 0, skip to CD. 23.

22	2E20.10	SS(I): $1 \leq I \leq 2$(NPSS); stress - plastic-strain curve data point pairs are read one pair per card (pair order set by IPSS on CD. 21) for NPSS cards. Note: (a) The first point must be the proportional limit stress corresponding to $\epsilon^{p}_{eq} = 0.0$. (b) The first strain value is assumed to be 0.0. If the first strain input value is ≥ 0.0, the stress-strain data are assumed to be in terms of octahedral quantities. If the first value is < 0.0, the data are assumed to be effective quantities. (c) The data must relate stress and logarithmic plastic strain.
23	16(I4, 1x)	NSF(I): $1 \leq I \leq$ NNF; boundary nodal force components which are to be summed and output as total applied load.
24	16(I4, 1x)	NPATH: Number of contours in the x-y plane on which the J integral is to be computed.

CD	Format	Data
24	16(I4, 1x)	Note: If NPATH = 0; no J integral computation is performed. (For J integral definition, see refs. 6 and 7.)

If NPATH = 0, skip to CD. 27.

Note: The J integral is computed as a contour integral on piecewise continuous paths defined in terms of segments each of which is finite-element boundary. Thus a single path is defined by N segments involving N + 1 nodes. An internal segment is bounded by two elements, a boundary segment by one.

25	16(I4, 1x)	NPSEG(I): $1 \leq I \leq$ NPATH; number of segments for each of the NPATH paths.
26(a)	16(I4, 1x)	[2]NDSEG(I): $1 \leq I \leq$ NPSEG(K) + 1; nodes defining path K, specified in counterclockwise order along the path.
26(b)	16(I4, 1x)	[2]NELSEG(I): $1 \leq I \leq 2$[NPSEG(K)]; elements bounding each of the segments defining path K. For internal segments two elements are identified by number;[3] for boundary segments the second number specified must be zero.
27	I4, 1x, 2F10.0	ISC: "Autoload" load substep scaling option key. ISC = 0: no scaling. = 1: prescribed loading increments will be divided into substeps within which EYP, ETO are satisfied. ETO: Maximum fractional incremental variation of octahedral stress in any element undergoing plastic flow. EYP: Maximum fractional overshoot of specified proportional limit stress in any element; or maximum overshoot of yield stress for yielding subsequent to elastic unloading.

[2]A pair of consecutive cards 26(a), 26(b) are needed for each of the NPATH paths being defined.

[3]Elements are assigned numbers according to their order of definition in the NM(I), CD. 9.

CD	Format	Data
27	I4, 1x, 2F10.0	Note: "Autoload" substeps will be counted in determining output printing and tape restart data generation points but are not considered in setting NINC on CDS. 1 and 3; K1, K2 on CD. 4 or in response to NPRNT on CD. 1.

Output Data

Specific output data from the FIPDEF program are dependent on the type of analysis performed and details of problem definition. All possible output messages and quantities are defined in this section.

Block	Generated for -	Contents, [generating subprogram], and OUTPUT MESSAGE
1	(see footnote 4)	Image of CD. 1. [IOPT].
2	NPT = 1	Image of CD. 2. [IOPT].
3	NPT = 0 or NPT = 1; NPTR = 3	START FROM CARDS. [IOPT]. One of the following: PLANE STRAIN FINITE DEFORMATION ANALYSIS PLANE STRAIN INFINITESIMAL DEFORMATION ANALYSIS PLANE STRESS FINITE DEFORMATION ANALYSIS PLANE STRESS FINITE DEFORMATION ANALYSIS THINNING SUPPRESSED PLANE STRESS INFINITESIMAL DEFORMATION ANALYSIS FOR ELEMENT --- THE BANDWIDTH HAS BEEN CHANGED FROM --- TO --- (If this message appears, a programmed stop follows immediately, indicating that IBD on CD. 8 must be increased). Image[5] of CDS. 7 to 26. [SETUPP]. Image of CD. 27. [IOPT].

[4]Output produced for all problems.

[5]Initial nodal coordinates are printed after scaling and shifting according to input CD. 11.

Block	Generated for -	Contents, [generating subprogram], and OUTPUT MESSAGE
4	NPT = 1	
	NPTR = 1	RESTART FROM TAPE. [IOPT].
	= 2	RESTART FROM CARDS.
5	NPT = 1	PROBLEM EXTENDED FROM K1 TO K2 STEPS.
	NPTR = 1, 2	K1 = increment number from restart data block.
	NEXT = 1	K2 = new final increment number NINC from CD. 3.
		TD VECTOR IS TD(I) $1 \leq I \leq$ K2. [IOPT].
6	NPT = 1	NUMBER OF SS POINTS IS NPSS.
	NPTR = 1, 2	SS(I) $1 \leq I \leq 2$(NPSS). [IOPT].
	NPROP = 1	
7(a)	footnote 4	STATE MAP STEP N-NAUTO. [PRNTIT]. Indicates successful completion of analysis for sub-step NAUTO of increment N.
7(b)	footnote 4	PROGRAM IS ITERATING ON STEP N-NAUTO LOADING REVERSAL FOR ITOT ELEMENTS THESE ELEMENTS ARE NREV(I) $1 \leq I \leq$ ITOT. [PRNTIT].
8	footnote 4	Element loading state key: generated for all iterations; integer display of IRV vector indicating state of each element; IRV(I) takes the values 1,. . ., 6; display FORMAT is labeled 4000. [PRNTIT].

IRV	Significance
1	elastic state
2	yield has occurred on this increment
3	continuing plastic flow
[6]4	elastic unloading detected
5	elastic unloading continues
[6]6	false detection of elastic unloading, plastic flow resumes.

[6]Detection of any element in this state causes its flow behavior to be appropriately modified and the incremental analysis to be repeated.

Block	Generated for -	Contents, [generating subprogram], and OUTPUT MESSAGE
9	Step 1 for NPRNT = 0,1	Problem definition data: NEL, NRD, IBD NZC, NDC, NFC YMD, GMD, PRT RKAP, SIGEQ YIELD NZP, NDP, NFP TD(1) or DBC (1,J) TF(1) or FBD (1,J) } see footnote 7. [OUTPUP].
10	Step N = PT for NPT = 1 NOUTR ≠ 0	TAPE RESTART GENERATION (IOPT) Binary write of restart data on logical file TAPE1. PT = N1 + (K) (NOUTR) - 1 N1 = first increment of present run K = 1, 2, 3, ...
11	[8]Step N = P*	THE APPLIED LOAD AT STEP N-NAUTO IS FT THE INCREMENTAL LOAD IS FI. [OUTPUT]. FT and FI are found as sums of nodal force components NSF(I). $1 \leq I \leq NNF$.
12	ISC = 1	SCALED STEP. [OUTPUP].
13	Step 1 for NPRNT = 0,1	Element map data: element-node key undeformed nodal coordinates. [OUTPUP].
14(a)	[8]Step N = P* INCP = 0	Current nodal coordinates Current nodal forces Current element centroid coordinates. [OUTPUP].
14(b)	[8]Step N = P* INCP = 1	Nodal output: current coordinates total displacements incremental displacements total forces incremental forces. [OUTPUP].

[7]Only those quantities appropriate to a particular problem will be printed.

[8]P* = NPRNT + (K) (NOUTP); K = 0, 1, 2, ...

Block	Generated for -	Contents, [generating subprogram], and OUTPUT MESSAGE
15	[8]Step N = P*	Element output: IRV (see block 8) Almansi strains - EPSX, EPSXY principal stresses in x-y plane - S1, S2 maximum shear stress - TM principal stress in radians from +x axis - THET Cauchy stresses - SIGY, SIGXY, SIGZ[9] equivalent stress - SIGEQ equivalent plastic strain - EP thickness stretch[10] - LZ. [OUTPUT].
16	[8]Step N = P*	Element output: elastic energy density plastic work density total work density hydrostatic tension.
17	[8]Step N = P*	THE ELASTIC ENERGY IS WE THE PLASTIC ENERGY IS WP THE TOTAL ENERGY IS WT FOR A LOAD OF FT
18	[8]Step N = P* NPATH ≠ 0	J1 = RJ1(I); $1 \leq I \leq$ NPATH J2 = RJ2(I); $1 \leq I \leq$ NPATH FOR NPATH PATHS J1 BAR = --- WITH STD. DEV. OF --- J2 BAR = --- WITH STD. DEV. OF --- $JIBAR = \frac{1}{NPATH}\left(\sum_{k=1}^{NPATH} JI_k\right)$; I = 1, 2 $STD.DEV. = \sqrt{\frac{1}{NPATH}\left[\sum_{k=1}^{NPATH} (JI_k - JIBAR)^2\right]}$

[9]Printed only from plane strain analysis.

[10]Printed only from plane stress analysis.

Block	Generated for -	Contents, [generating subprogram], and OUTPUT MESSAGE
18	[8]Step N = P* NPATH ≠ 0	J1 = J_x; J2 = J_y The J integral is computed in accordance with reference 7. In a hyperelastic body it provides the energy release rate per unit translation of a cavity in a stressed body; deriving its vector sense from the direction of translation. Its physical significance, if any, for elastoplastic bodies is a matter of conjecture.

Program Structure

The FIPDEF program consists of a main program and 24 subprograms. The logical connection between these program units is shown in figure 1. The function of each subprogram is as follows:

Subprogram	Function
FIPDEF	program execution control
PROCES	data flow control
IOPT	input-output control
SETUPP	card input processor
SETRST	restart data processor
OUTPUP	printed output
KGEN	stiffness matrix generation control
CNSTT1/2	element property matrix generation
GKT1/2	upper triangular stiffness matrix generation
GKB1/2	lower triangular stiffness matrix generation
PROG	incremental results processor
DGRADP	element displacement gradient evaluation
STRESP	element stress evaluation
MODEP	element loading state evaluation and autoload increment scaling

[8]P* = NPRNT + (K)(NOUTP); K = 0, 1, 2, ...

Subprogram	Function
TMODP	element loading state evaluation and autoload increment scaling
STRANP	element strain evaluation
PRNTIT	element loading state map print
JCOMP	J integral and element energy evaluation
SOLVE	stiffness equation solution control
STBC	boundary condition processor
SLVQ2	nodal incremental displacement solution
FRCMP	nodal incremental force evaluation

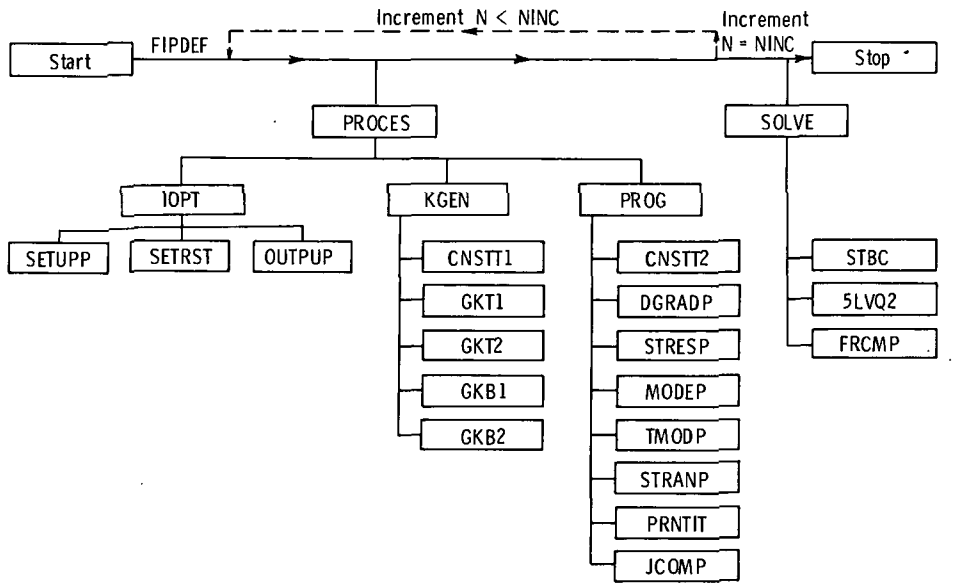


Figure 1. - FIPDEF subprogram flow.

The program executes in overlay form. There are six overlays at three levels of core which are loaded in one of four combinations, or links, at various times during execution:

Link	Overlays loaded	Function
1	(0,0),(1,0),(1,1)	Input/output
2	(0,0),(1,0),(1,2)	Stiffness matrix generation
3	(0,0),(2,0)	Displacement solution
4	(0,0),(1,0),(1,3)	Result processing

The overlay structure is given in figure 2. Logical files employed are identified as follows:

File	Usage	Used by subprograms
TAPE1	Restart data	SETRST
TAPE5	Input	IOPT, SETUPP
TAPE6	Output	IOPT, SETUPP, OUTPUP, PRNTIT
TAPE7	Punch	SETRST
TAPE17	Temporary storage	SETRST
TAPE18	Temporary storage	KGEN, SOLVE
TAPE19	Temporary storage	KGEN, SOLVE
TAPE25	Temporary storage	KGEN, PROG

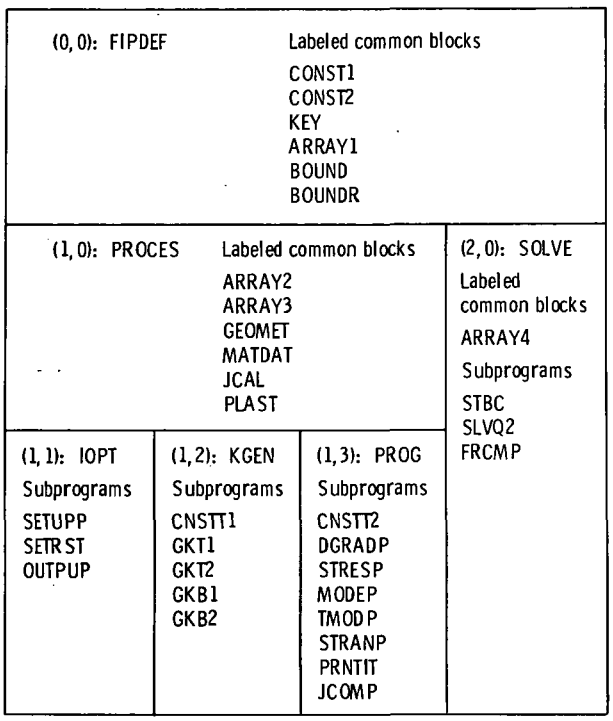


Figure 2. - FIPDEF overlay structure.

Array Dimensions

All array variables are dimensioned in labeled common block declarations. The labeled common blocks, their array contents, and problem dependent minimum array dimensions are given in this section. The content of common block ARRAY3 varies between overlays. Overlay locations for each form of the block are indicated in figure 2. Array dimensions are given in terms of problem input parameters defined in the FIPDEF input section.

Block	Variable	Dimensions
ARRAY1	FO	NRD
	DIS	NRD
	TITL	8
ARRAY2	SE	7(NEL)
	FT	NRD
	TDYX33	NEL
ARRAY3	A(I, J)	$1 \leq I \leq IBD$ $1 \leq J \leq NRD$
Overlays:		
(1,0),(1,2)	WASTE1	KK1[11]
ARRAY3	RPT	NEL
	EOT	NEL
Overlays:	TO	NEL
(1,1),(1,3)	DIST	NRD
	DISI	NRD
	EA	4(NEL)
	ST	7(NEL)
	IRV	NEL
	NREV	NEL
	SP	4(NEL)
	DGD	4(NEL)
	WE	NEL
	WPT	NEL
	WASTE2	KK2[11]

[11] $K = (IBD)(NRD) - 26\,(NEL) - (2NRD)$. When $K > 0$, $KK2 = |K|$, $KK1 = 0$; when $K < 0$, $KK1 = |K|$, $KK2 = 0$.

Block	Variable	Dimensions
ARRAY4	A(I, J)	$1 \leq I \leq [2(IBD) - 1]$ $1 \leq J \leq NRD$
BOUND	TF[12]	NINC
	TD	NINC
	NSF	NNF
BOUNDR	NDP	NDC
	NFP	NFC
	NZP	NZC
	DBC(I, J)[12]	$1 \leq I \leq NINC$ $1 \leq J \leq NDC$
	FBC(I, J)[12]	$1 \leq I \leq NINC$ $1 \leq J \leq NFC$
GEOMET	NM	3(NEL)
	XYM	NRD
	XYMO	NRD
MATDAT	SS	2(NPSS)
	RP	NEL
	TO1	NEL
	IDB	NEL
	EO	NEL
JCAL	NPSEG	NPATH
	RJ1	NPATH
	RJ2	NPATH
	NDSEG	NNODE[13]
	NELSEG	NELEM[14]
	WP	NEL

[12]Dimensions shown are maximum possible; e.g., if NDIS = 0, TD is dimensioned to NINC, but DBC may be set to (1, 1) as it is not used.

[13]NNODE is the total number of nodes required to define the NPATH paths.

[14]NELEM is the twice the total number of segments comprising the NPATH paths.

Analysis capability is provided for problems of either infinitesimal or finite axisymmetric deformation. The analysis is restricted to consideration of problems involving axisymmetric geometry and loading.

Restart data blocks drawn from any integration step of an analysis may be retained on tape.

In the following sections information is provided on input/output data, program structure, and array variable dimensions.

Input Data

In this section the complete FIPAX input card stream for both initialization and restart problems is defined. Note that not all input cards defined will be present for a given problem.

CD	Format	Data
1	16(I4, 1x)	NINC: Number of loading increments. NPRNT: Increment number for initial output printing (default value, 1). NPT: Input source key. NPT = 0: initial card input; no restart data to be generated. = 1: restart problem or initial problem card input with restart data to be generated. Note: NPT = 1 is admissible only for NDIS = 0 on CD. 9 and NFC = 0 on CD. 13. NPRNTI: Increment/substep output print interval (default value, 1). ISC: Autoload substep scaling option key. ISC = 0: no scaling. = 1: prescribed loading increments will be divided into substeps within which EYP and ETO are satisfied. EYP: Maximum percentage overshoot of specified proportional limit stress in any element; or maximum overshoot of yield stress for yield subsequent to elastic unloading. ETO Maximum percentage variation of octahedral stress over a substep in any element undergoing plastic flow.

CD	Format	Data

1 16(I4, 1x)

Note: "Autoload" substeps will be counted in determining output printing and tape restart data generation points but are not considered in setting NINC on CDS. 1, 4; K1, K2 on CD. 5 or in response to NPRNT on CD. 1.

NINF: Deformation mode key.

NINF = 0: finite deformation analysis.

= 1: infinitesimal deformation analysis.

If NPT = 0, skip to CD. 8.

2 16(I4, 1x)

NPT1: Restart data control.

NPT1 = 1: initial problem from card data with restart data to be generated.

= 2: restart problem from tape data with problem modification.

= 3: restart problem from tape with no problem modification.

NRSTI: Increment/substep interval for tape restart data generation (default is no data generation).

NTBLK: Number of restart data block on file TAPE1 from which problem data are to be obtained.

NTMAX: Total number of restart data blocks on file TAPE1.

Note: (a) Analysis will restart from block NTBLK and further restart blocks will be placed following block NTMAX.

(b) NTBLK, NTMAX are ignored for NPT1 = 1.

NFINT: Final increment/substep restart data generation for ISC = 1 (ignored for ISC = 0).

NFINT = 0: Final increment/substep analysis restart data generation is not guaranteed.

= 1: Final increment/substep analysis results will be printed and restart data placed on file TAPE1.

If NPT1 = 1, skip to CD. 8.

If NPT1 = 3, END OF INPUT.

3 16(I4, 1x)

NEXT: Restart problem extension key (ignored for NPT1 = 1).

NEXT = 0: no problem extension.

= 1: problem extended by increasing the number of loading increments.

CD	Format	Data
3	16(I4, 1x)	NPROP: Restart problem stress-strain curve key (ignored for NPT1 = 1). NPROP = 0: use original curve. = 1: new curve to be supplied.

If NEXT = 0, skip to CD. 6.

4	I4	NINC: New maximum number of loading increments.
5	10F8.5	TD(I): K1 $\leq$ I $\leq$ K2 (see CD. 15). K1 = First increment number of restarted problem. K2 = NINC on CD. 4.

If NPROP = 0, END OF INPUT.

6	16(I4, 1x)	IPSS: Input order for revised stress-strain curve (see CD. 22). NPSS: Number of data points on revised stress-strain curve (see CD. 22); NPSS $\geq$ 3.
7	2E20.10	SS(I): 1 $\leq$ I $\leq$ 2(NPSS). Revised stress-strain curve data point vector (see CD. 23).

END OF RESTART PROBLEM INPUT.

8	A1, 7A10	NCAR: Output carriage control character. TITLE: Alphanumeric, up to 70 characters.
9	16(I4, 1x)	IBD: Bandwidth = 2 ($\|$N2 - N1$\|$ + 1), where $\|$N2 - N1$\|$ = maximum difference in numbers assigned to adjacent nodes. NRD: Number of degrees of freedom associated with complete problem before application of boundary conditions. NEL: Number of elements. NRZ: Nodal coordinate input format key for CD. 11. NRZ = 1: five nodal coordinate pairs per card. = 2: one nodal coordinate pair per card. NDIS: Incremental displacement boundary condition mode. NDIS = 0: uniform. = 1: nonuniform. NF: Incremental force boundary condition mode. NF = 0: uniform. = 1: nonuniform.

CD	Format	Data
10	8(3I3, 1x)	NM(I): $1 \leq I \leq 3(NEL)$; element definition, node identification in counterclockwise order around each element.
11	10F8.5	RZMO(I): $1 \leq I \leq NRD$; original nodal coordinates in (r, z) pairs (see NRZ, CD.9).
12	4E10.5	SFR: r coordinate scale factor. SFZ: z coordinate scale factor. DR: r coordinate shift after scaling. DZ: z coordinate shift after scaling.
13	16(I4, 1x)	NDC: Number of degrees of freedom eliminated by nonzero incremental displacement conditions. NZC: Number of degrees of freedom eliminated by zero incremental displacement conditions. NFC: Number of degrees of freedom eliminated by nonzero incremental force conditions. IDBC: Incremental nodal displacement boundary condition array input order (see CD. 16) (ignored for NDIS = 0 on CD. 9). IFBC: Incremental nodal force boundary condition array input order (see CD. 20) (ignored for NF = 0 on CD. 9). NNF: Number of boundary nodal force components included in boundary load summation (see CD. 24).

If NDC = 0, skip to CD.17.

14	16(I4, 1x)	NDP(I): $1 \leq I \leq NDC$; identification of boundary incremental nodal displacement components set to nonzero values.

If NDIS = 1, skip to CD.16.

15	10F8.3	TD(I): $1 \leq I \leq NINC$; values of uniform boundary incremental nodal displacement.

If NDIS = 0, skip to CD.17.

16	10F8.3	DBC(I, J): $1 \leq I \leq NINC$ array (NINC rows, NDC columns) $1 \leq J \leq NDC$ Incremental nodal displacement boundary condition value array. Input order is governed by IDBC (CD. 13) as

CD	Format	Data
16	10F8.3	IDBC = 0: input DBC by columns. = 1: input DBC by rows. Values are assigned to particular boundary displacements in the order of specification of the NDP(I) on CD. 14; e.g., DBC(I, J) = incremental value assigned to displacement NDP(J) at increment I.
17	16(I4, 1x)	NZP(I): $1 < I < NZC$; nodal incremental displacement components set to zero value for all increments.

If NFC = 0, skip to CD. 21.

18	16(I4, 1x)	NFP(I): $1 \leq I \leq NFC$; identification of boundary nodal incremental force components set to nonzero values.

If NF = 1, skip to CD. 20.

19	10F8.2	TF(I): $1 \leq I \leq NINC$; values of uniform incremental nodal forces.

If NF = 0, skip to CD. 21.

20	10F8.2	FBC(I, J): Nonuniform boundary nodal incremental force boundary condition value array; defined analogously to DBC(I, J) (CD. 16) in terms of NINC, NFC, IFBC, NFP.
21	3E20.8	PRT: Poisson's ratio, elastic. YMD: Young's modulus, elastic. RKAP: Bulk modulus, elastic. Note: For PRT < 0.5, input value of RKAP is ignored and RKAP = YMD/[3(1 - 2PRT)] is used.
22	16(I4, 1x)	IPSS: Stress - plastic-strain data point pair input order key. IPSS = 0, = 1 } the input order is $\begin{cases} \sigma_{eq}, \epsilon^p_{eq} \\ \epsilon^p_{eq}, \sigma_{eq} \end{cases}$ NPSS: Number of stress - plastic-strain curve input points; NPSS ≥ 3. Note: If NPSS = 0, an elastic analysis will be performed; the maximum octahedral stress must be less than 10^{10} lb/in.^{2}.

If NPSS = 0, skip to CD. 24.

CD	Format	Data
23	2E20.10	SS(I): $1 < I < 2(NPSS)$; stress - plastic-strain curve data point pairs are read one pair per card (pair order set by IPSS on CD. 22) for NPSS cards. Note: (a) The first point must be the proportional limit stress corresponding to $\epsilon^{p}_{eq} = 0.0$. (b) The first plastic-strain value is assumed to be 0.0. If the input strain value is ≥ 0.0, the stress - plastic-strain data are assumed to be in terms of octahedral quantities. If the first value is <0.0, the data are assumed to be effective quantities. (c) The data must relate stress and logarithmic plastic strain.
24	16(I4, 1x)	NSF(I): $1 \leq I \leq NNF$; boundary nodal force components which are to be summed and output as total applied load.
25	16(I4, 1x)	NPATH: Number of loci in r-z plane of axisymmetric closed surfaces on which J integral is to be computed. Note: If NPATH = 0; no J integral computation is performed.

If NPATH = 0, end of input.

Note: The J integral is computed as an integral on a cylindrical surface whose locus in the r-z plane is a piecewise continuous path defined in terms of segments, each of which is a finite-element boundary. Thus a single path is defined by N segments involving N + 1 nodes. An internal segment is bounded by two elements; a boundary segment by one.

26	16(I4, 1x)	NPSEG(I): $1 \leq I \leq NPATH$; number of segments for each of the NPATH paths.
27(a)	16(I4, 1x)	NDSEG(I):[15] $1 \leq I \leq NPSEG(K) + 1$; nodes defining path K, specified in counterclockwise order along path.
27(b)	16(I4, 1x)	NELSEG(I):[15] $1 \leq I \leq 2[NPSEG(K)]$; elements bounding each segment defining path K. For internal segments two elements are identified by number; for boundary segments the second element number specified must be zero.

[15] A pair of consecutive cards 27(a) and 27(b) are required for each of the NPATH paths being defined.

Output Data

Specific data from the FIPAX program are dependent on the type of analysis performed and on the details of problem definition. All possible output messages and data are defined in this section.

Block	Generated for -	Contents [generating subprogram] and OUTPUT MESSAGE
1	(See footnote 4)	Image of CD. 1. [PROCES].
2	NPT = 1	Image of CD. 2. [PROCES].
3	NPT = 1 NPT1 = 2,3	RESTART FROM TAPE. [PROCES].
4	NPT = 1 NPT1 = 2	Image of CD. 3. [PROCES].
5	NPT = 1 NPT1 = 2, NEXT = 1	Image of CD. 4. [PROCES].
		PROBLEM EXTENDED FROM K1 TO K2 STEPS K1 = increment number from restart data block. K2 = new final increment number from CD. 4.
		THE NEW TD VECTOR IS
6	NPT = 1, NPT1 = 2 NPROP = 1	Image of CD. 6. [PROCES].
		THE NEW SS CURVE IS
7	NPT = 0 or NPT = 1, NPT1 = 1	FOR ELEMENT --- THE BANDWIDTH MUST BE CHANGED FROM --- TO --- (SETC) (If this message appears, a programmed stop follows immediately, indicating that IBD on CD. 9 must be increased).
8	NPT = 0 or NPT = 1, NPT1 = 0	Image[16] of CD. 8 to 27. [SETC].
		START FROM CARDS. [PROCES].

[4]Output produced for all problems.

[16]Initial nodal coordinates are printed after scaling and shifting according to input CD. 12.

Block	Generated for -	Contents [generating subprogram] and OUTPUT MESSAGE
9(a)	See footnote 4	STATE MAP STEP N-NAUTO. [PRNTA]. Indicates successful completion of substep NAUTO of increment N.
9(b)	See footnote 4	PROGRAM IS ITERATING ON STEP N-NAUTO. LOADING REVERSAL FOR ITOT ELEMENTS THESE ELEMENTS ARE ---. [PRNTA].
10	See footnote 4	Element loading state key: generated for all increment/substep iterations; integer display of IRV vector indicating state of each element. IRV(I) takes values 1,. . ., 6. Display FORMAT is labeled 4000. [PRNTA].
		IRV — Significance
		1 — elastic state
		2 — yield has occurred on this increment/substep
		3 — continuing plastic flow
		[17]4 — elastic unloading detected
		5 — elastic unloading continues
		[17]6 — false detection of elastic unloading, plastic flow resumes.
11	Increment 1, substep 1 for NPRNT = 0	Element map data: Element-node key undeformed nodal coordinates. [OUTPT].
		Problem definition data: NEL, NRD, IBD, NINC NZC, NDC, NFG YMD, GMD, PRT, RKAP (σ_{eq}) yield (either octahedral of effective, depending on SS input form; see CD. 23).

[4]Output produced for all problems.

[17]Detection of any element in this state causes its flow behavior to be appropriately modified and the increment/substep analysis to be repeated.

Block	Generated for -	Contents [generating subprogram] and OUTPUT MESSAGE
12	Increment/substep N = K(NPRNTI) K = 1, 2, 3, . . . for increments N* > NPRNT	Nodal data: total displacements incremental displacements incremental forces total forces *nodal coordinates*. [OUTPT]. Element stress data: IRV (see block 10) Cauchy stress - SR, ST, SZ, SRZ principal stress in r-z plane - S1, S2 *maximum shear stress* principal stress in r-z plane in radians from +z axis - TS octahedral or effective stress - SIGEO hydrostatic stress - S deviatoric stress invariants - J2, J3.
13	Increment/substep N = K(NPRNTI) K = 1, 2, 3, . . . for increments N* > NPRNT	Element deformation data: element centroid coordinates - RC, ZC Almansi strains - ER, ET, EZ, ERZ coordinate direction stretches - LR, LZ, LT principal stretches (in r-z plane) - L1, L2 principal stretch axis orientation in radians from +z axis - TL r-z plane shear angle - TS r-z plane element rotation - TR octahedral or effective plastic strain - EPSEQP. [OUTPT].
14	Increment/substep N = K(NPRNTI) K = 1, 2, 3, . . . for increments N* > NPRNT	Element energy data: elastic energy density plastic energy density total energy density hydrostatic stress. [OUTPT].

Block	Generated for -	Contents [generating subprogram] and OUTPUT MESSAGE
15	Increment/substep N = K(NPRNTI) K = 1, 2, 3, . . . for increments N* > NPRNT	Problem energy summary [OUTPT]: THE ELASTIC ENERGY IS --- THE PLASTIC ENERGY IS --- THE TOTAL ENERGY IS --- FOR A LOAD OF --- J1 = RJ1(I) $1 \leq I \leq$ NPATH J2 = RJ2(I) $1 \leq I \leq$ NPATH FOR --- PATHS J1BAR = --- WITH STD. DEV. OF --- J2BAR = --- WITH STD. DEV. OF --- $JIBAR = \frac{1}{NPATH}\left(\sum_{k=1}^{NPATH} JI_k\right);\ I = 1, 2$ $STD.DEV. = \sqrt{\frac{1}{NPATH}\left[\sum_{k=1}^{NPATH} (JI_k - JIBAR)^2\right]}$ $J1 = J_r;\ J2 = J_z$ The J integral is computed in accordance with reference 7. In a hyperelastic body it provides the energy release rate per unit translation of a cavity in a stressed body deriving its vector sense from the direction of translation. Its physical significance, if any, for elastoplastic bodies is a matter of conjecture.
16	Increment/substep N = K(NPRNTI) K = 1, 2, 3, . . . for increments N* > NPRNT	THIS IS INCREMENT N-NAUTO OF NINC THE APPLIED LOAD IS FT THE INCREMENTAL LOAD IS FI. [OUTPT].

Block	Generated for -	Contents [generating subprogram] and OUTPUT MESSAGE
17	Increment/substep N = K(NPRNTI) K = 1, 2, 3, . . . for increments N* > NPRNT and ISC = 1	SCALED STEP. [OUTPT] Message printed if autoload defined substep has been introduced.
18	NRSTI ≠ 0 for increment/substep N = K(NRSTI) K = 1, 2, 3, . . .	TAPE RESTART GENERATION STEP N-NAUTO OF NINC

Program Structure

The FIPAX program consists of a main program and 23 subprograms. The logical connection between these program units is given in figure 3. The function of each subprogram is as follows:

Subprogram	Function
FIPAX	program execution control
PROCES	incremental analysis setup and result evaluation control
SETC	input processor
SETRST	restart data processor
OUTPT	printed output
PSET	stiffness matrix generation control
PMAT1	element property matrix generation
INTEGR	element geometry integral evaluation
GKT1/2	upper triangular stiffness matrix generation
GKB1/2	lower triangular stiffness matrix generation
CEVAL	incremental result processor
VGRD	element displacement gradient evaluation
STRSA	element stress evaluation

Subprogram	Function
MDA	element loading state evaluation and autoload increment scaling
TMDA	element plastic modulus evaluation
STRNA	element deformation evaluation
PRNTA	element loading state map print
JCOMP	J integral evaluation
PSLV	stiffness equation solution control
STBC	boundary condition processor
SLVQ	nodal incremental displacement solution
FRCMP	nodal incremental force evaluation

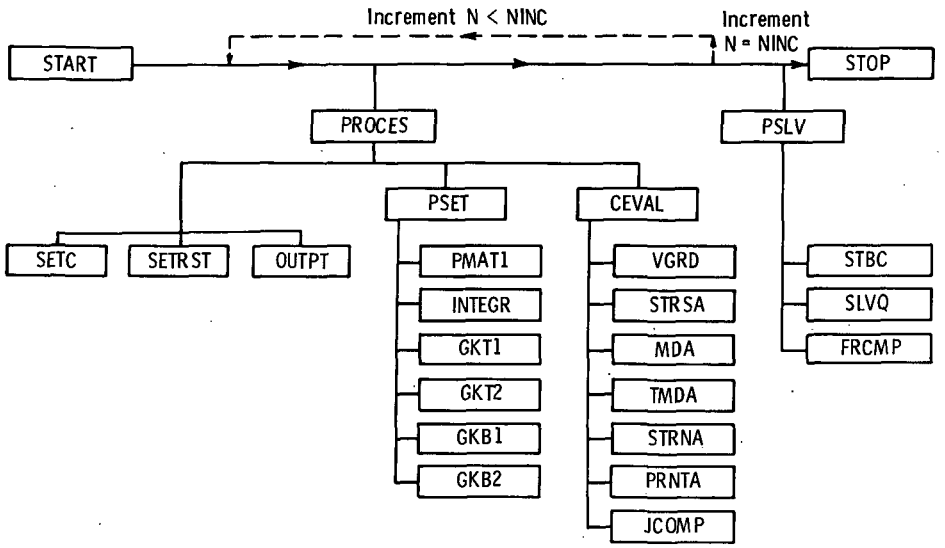
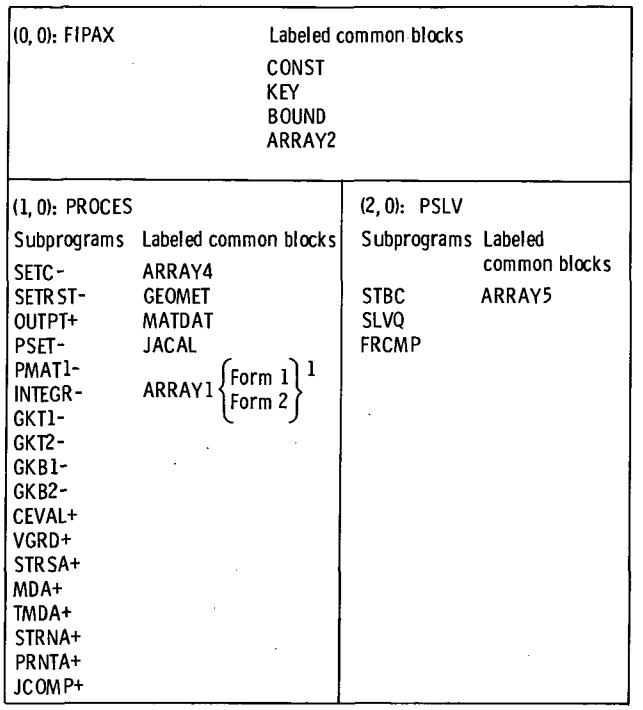


Figure 3. - FIPAX subprogram flow.

The program executes in overlay form. There are three overlays at two levels of core that are loaded in one of two combinations, or links, at different stages of execution:

Link	Overlays loaded	Function
1	(0, 0), (1, 0)	Input/output, stiffness matrix generation, and result processing
2	(0, 0), (2, 0)	Displacement solution



[1]Use ARRAY1 form 1 in subprograms marked -; use ARRAY 1 form 2 in subprograms marked +

Figure 4. - FIPAX overlay structure.

Overlay structure is given in figure 4. Logical files used are identified as follows:

File	Usage	Used by subprograms
TAPE1	Restart data; temporary storage	SETRST PROCES
TAPE5	Input	PROCES SETC
TAPE6	Output	PROCES OUTPT PRNTA
TAPE18	Temporary storage	PSET
TAPE19	Temporary storage	PSET PSLV
TAPE25	Temporary storage	PROCES SETRST

Array Dimensions

All array variables are dimensioned in labeled common block declarations. Labeled common blocks, their array contents, and problem dependent minimum array dimensions are given in this section.

The array content of common block ARRAY1 varies between subprograms of overlay (1,0). Subprogram locations for each form of the block are indicated in figure 4. Array dimensions are given in terms of problem input parameters defined in figure 3.

Block	Variable	Dimensions
ARRAY1, form 1[18]	T(I, J)	$1 \leq I \leq$ IBD $1 \leq J \leq$ NRD
	WASTE2	KK2[19]
ARRAY1, form 2[18]	RPT	NEL
	EOT	NEL
	TO	NEL
	IRV	NEL
	NREV	NEL
	THTL	NEL
	SHR	NEL
	ROT	NEL
	EA	4(NEL)
	ST	4(NEL)
	DGD	5(NEL)
	STR	3(NEL)
	STRP	3(NEL)
	DIST	NRD
	WE	NEL
	WPT	NEL
	WASTE1	KK1[19]
ARRAY2	DIS	NRD
	FO	NRD
	TITL	8
ARRAY4	SE	4(NEL)
	FT	NRD
ARRAY5	A(I, J)	$1 \leq I \leq [2(\text{IBD}) - 1]$ $1 \leq J \leq$ NRD

[18] See fig. 4.

[19] K = (IBD)(NRD) - 29(NEL) - NRD. If $K > 0$, KK1 + $|K|$ and KK2 = 0. If $K < 0$, KK1 = 0 and KK2 = $|K|$.

Block	Variable	Dimensions
GEOMET	NM	2(NEL)
	XYMO	NRD
	XYM	NRD
	E(I, J)	$1 \leq I \leq 3$ $1 \leq J \leq$ NEL
MATDAT	SS+	2(NPSS)
	RP	NEL
	TO1	
	IDB	
	EO	
JACAL	NPSEG	NPATH
	RJ1	
	RJ2	
	NDSEG	NNODE[20]
	NELSEG	NELEM[21]
	WP	NEL
BOUND	TF[22]	NINC
	TD[22]	NINC
	DBC(I, J)	$1 \leq I \leq$ NINC, $1 \leq J \leq$ NDC
	FBC(I, J)	$1 \leq I \leq$ NINC, $1 \leq J \leq$ NFC
	NSF	NNF
	NDP	NDC
	NFP	NFC
	NZP	NZC

SAMPLE PROBLEMS

Input and output are presented for four simple sample problems: two for each of the FIPDEF and FIPAX programs. The problems are not intended to indicate the scope of application of the analysis but rather to provide an input preparation and output interpretation exercise for the user. Consequently, the examples are restricted to displacement

[20] NNODE = total number of nodes required to define the NPATH paths.

[21] NELEM = twice the total number of segments comprising the NPATH paths.

[22] Dimensions shown are maximum possible, e.g., if NDIS = 0, then TD is dimensioned to NINC but DBC may be set to (1, 1) as it is not used.

bounded problems involving bilinear elastoplastic materials and simple geometries. Since the program input data provide a complete problem definition, no additional discussion is necessary.

The four problems are as follows: For FIPDEF

(1) Tables I and II - simple tension of a rectangular bar under conditions of plane strain; two-element map (fig. 5).

(2) Tables III and IV - biaxial tension of a rectangular bar under conditions of plane stress; two-element map (fig. 5).

and for FIPAX

(3) Tables V and VI - expansion of a thick-walled cylinder under zero axial load with restart data generation; 40-element map (fig. 6).

(4) Tables VII and VIII - restart from problem (3) and continue expansion of the cylinder.

All problems use finite deformation analysis. The autoload integration step scaling is used in problems (2) to (4).

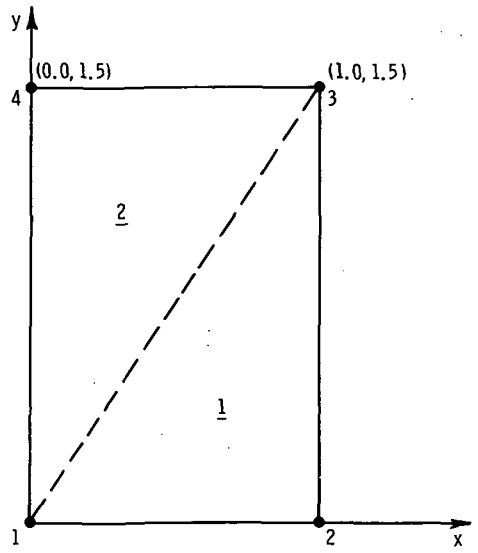


Figure 5. - Undeformed finite-element model sample problems (1) and (2). Node numbers, i; element numbers, $\underline{i}$.

TABLE I. - SAMPLE PROBLEM (1) - INPUT

STATEMENT NUMBER	CONT	FORTRAN STATEMENT	IDENTIFICATION
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 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72	73 74 75 76 77 78 79 80
2		1	
SAMPLE PROBLEM 1 PLANE STRAIN UNIAXIAL EXTENSION			
8		8 2 1 0 0 2	
1	2	3 1 3 4	
		0.0 0.0 1.0 0.0 1.0 1.5 0.0 1.5	
		1.0 1.0 0.0 0.0	
2		4 0 0 0 2	
6		8	
0.0154 0.0100			
1		2 4 7	
		0.3 1000000.0	
0		3	
		10000.0 -.1	
		110000.0 1.0	
		210000.0 2.0	
6		8	
0			
0			
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 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72	73 74 75 76 77 78 79 80

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TABLE II. - SAMPLE PROBLEM (1) - OUTPUT

```
   2    1   -0   -0   -0   -0   -0
START FROM CARDS
PLANE STRAIN FINITE DEFORMATION ANALYSIS

 PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*

FOR REFERENCE, THE INPUT DECK IS REPRODUCED IN ITS ENTIRETY

    SAMPLE PROBLEM 1 PLANE STRAIN  UNIAXIAL EXTENSION
     6     2     2     1     0     0     2
     1   2   3     1   3   4
 0.0000 0.0000  1.0000 0.0000  1.0000 1.5000  0.0000 1.5000
                00.10000000E+01     00.10000000E+01      0.E+00              0.E+00
     2     4     0     0     0     2
       6       8
0.1540E-01 0.1000E-01
     1     2     4     7
                          00.30000000E+00              00.10000000E+07              -0.E+00
   0   3
.10000E+05 -.10000E+00 0.11000E+06 0.10000E+01 0.21000E+06 0.20000E+01
     6     8
     0
                                    0 -0.E+00     -0.E+00

 PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*

STATE MAP  STEP    1 -    1

  2  2
SAMPLE PROBLEM 1 PLANE STRAIN  UNIAXIAL EXTENSION                    STEP   1-   1 OF   2
                                  GEOMETRY  SUMMARY
                          ELE        NODES              COORDINATES
                           N     N1    N2   N3      XN1       YN1       XN2       YN2       XN3       YN3

                           1     1     2     3   0.00000   0.00000   1.00000   0.00000   1.00000   1.50000
 Y Y                       2     1     3     4   0.00000   0.00000   1.00000   1.50000   0.00000   1.50000
*PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN*
SAMPLE PROBLEM 1 PLANE STRAIN  UNIAXIAL EXTENSION                    STEP   1-   1 OF   2
  Y                                          PROBLEM SUMMARY
   Y

                                NEL=   2   NZC=   4   NINC=   2  YMD=10.00000E+05     RKAP= 83.33325E+04
                                NRD=   8   NDC=   2              GMD=38.46154E+04
                                IBD=   6   NFC=   0              PRT=0.30000                 Y Y
                                                                 SIGEQ YIELD=  10000.00

                          THIS IS INCREMENT    1 OF    2

                          ZERO DISPLACEMENT DEGREES OF FREEDOM ARE     1   2   4   7   0   0   0   0   0   0
                          ZERO DISPLACEMENT DEGREES OF FREEDOM ARE     1   2   4   7

                          DISPLACEMENT BOUNDED DEGREES OF FREEDOM ARE
```

TABLE II. - Concluded. SAMPLE PROBLEM (1) - OUTPUT

```
                                NOP(I)=        0        8
                                DU=  0.01540
*PLANE ST-AIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN*
THE APPLIED LOAD AT STEP  1-    1 IS      0.11282E+05
THE INC. LOAD IS     0.11282E+05
SAMPLE PROBLEM 1 PLANE STRAIN  UNIAXIAL EXTENSION                          STEP   1-   1 OF   2
NODAL COORDINATES
  0.000000    0.000000     00.995600    0.000000     00.995600    1.515400     0.000000    1.515400
SAMPLE PROBLEM 1 PLANE STRAIN  UNIAXIAL EXTENSION                          STEP   1-   1 OF   2
NODAL FORCES
     -0.0      -5641.0          00.0      -5641.0          00.0       5641.0          -0.0       5641.0
SAMPLE PROBLEM 1 PLANE STRAIN  UNIAXIAL EXTENSION                          STEP   1-   1 OF   2
ELEMENT CENTROID COORDINATES
 00.663733   00.505133    00.331867    1.010267
SAMPLE PROBLEM 1 PLANE STRAIN  UNIAXIAL EXTENSION                          STEP   1-   1 OF   2
                                                        DKOLDMT C+T+

ELE          ALMANSI STRAIN                      PRINCIPAL STRESS                                CAUCHY STRESS

 N IRV EPSX     EPSY     EPSXY      S1          S2          TM     THET      SIG X       SIG Y       SIG Z       SIG XY      SIGEQ EP

  1 2-0.0044 0.0101-0.0000 0.1128E+05 0.8731E-10 0.5641E+041.5708 0.8731E-10 0.1128E+05 0.3385E+04-0.7323E-11 0.1003E+05 0.E+00
  2 2-0.0044 0.0101 0.0000 0.1128E+05 0.8731E-10 0.5641E+041.5708 0.8731E-10 0.1128E+05 0.3385E+04 0.E+00      0.1003E+05 0.E+00
*PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN*
 ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.          ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.
   1 00.57915E+02  0.E+00       00.57915E+02 00.48889E+04           2 00.57915E+02  0.E+00       00.57915E+02 00.48889E+04

THE ELASTIC ENERGY IS          00.873775E+02
THE PLASTIC ENERGY IS           0.E+00
THE TOTAL ENERGY IS      00.873775E+02FOR A LOAD OF      00.112821E+05


STATE MAP  STEP   2 -     1
      Y Y
THE APPLIED LOAD AT STEP  2-    1 IS      0.12288E+05
THE INC. LOAD IS     0.10059E+04
SAMPLE PROBLEM 1 PLANE STRAIN  UNIAXIAL EXTENSION                          STEP   2-   1 OF   2
NODAL COORDINATES
  0.000000    0.000000     00.990152    0.000000     00.990152    1.525400     0.000000    1.525400
SAMPLE PROBLEM 1 PLANE STRAIN  UNIAXIAL EXTENSION                          STEP   2-   1 OF   2
NODAL FORCES
     -0.0      -6144.0          00.0      -6144.0          00.0       6144.0          -0.0       6144.0
SAMPLE PROBLEM 1 PLANE STRAIN  UNIAXIAL EXTENSION                          STEP   2-   1 OF   2
ELEMENT CENTROID COORDINATES
 00.660101   00.508467    00.330051    1.016933
SAMPLE PROBLEM 1 PLANE STRAIN  UNIAXIAL EXTENSION                          STEP   2-   1 OF   2
                                                        ELEMENT DATA

ELE          ALMANSI STRAIN                      PRINCIPAL STRESS                                CAUCHY STRESS

Y + IN* EPSX     EPSY     EPSXY      S1          S2          TM     THET      SIG X       SIG Y       SIG Z       SIG XY      SIGEQ EP

  1 3-0.0100 0.0165-0.0000 0.1235E+05 0.2047E-09 0.6177E+041.5708 0.1746E-09 0.1235E+05 0.5130E+04-0.1639E-10 0.1075E+05 0.7232E-01 Y
  2 3-0.0100 0.0165 0.0000 0.1235E+05 0.1164E-09 0.6177E+041.5708 0.8732E-10 0.1235E+05 0.5130E+04 0.E+00      0.1075E+05 0.7232E-02
*PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN**PLANE STRAIN*

 ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.          ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.
   1 00.69453E+02 00.72522E+02 00.14198E+03 00.58283E+04           2 00.69453E+02 00.72522E+02 00.14198E+03 00.58283E+04

THE ELASTIC ENERGY IS          00.104900E+03
THE PLASTIC ENERGY IS          00.109536E+03
THE TOTAL ENERGY IS      00.214436E+03FOR A LOAD OF      00.122880E+05
```

TABLE III. - SAMPLE PROBLEM (2) - INPUT

STATEMENT NUMBER	CONT.	FORTRAN STATEMENT	IDENTIFICATION
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 51 52 53 54 | 55 56 57 58 59 60 | 61 62 63 64 65 66 | 67 68 69 70 71 72	73 74 75 76 77 78 79 80
2		1 0 0 0 0 1	
SAMPLE PROBLEM 2 PLANE STRESS BIAXIAL EXTENSION			
8		8 2 1 1 0 1	
1	2	3 1 3 4	
		0.0 0.0 1.0 0.0 1.0 1.5 0.0 1.5	
		1.0 1.0 0.0 0.0	
4		4 0 1 0 4	
3		6 8 5	
0.0		71 0.0106 0.0106 0.0071 0.01 0.01 0.01 0.01	
1		2 4 7	
		0.3 10000000.0	
1		3	
		0.0 4714.0	
		0.707 11 51854.0	
		1.414 21 98995.0	
2		4 6 8	
0			
1		0.05 0.01	
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 51 52 53 54 | 55 56 57 58 59 60 | 61 62 63 64 65 66 | 67 68 69 70 71 72	73 74 75 76 77 78 79 80

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TABLE IV. - SAMPLE PROBLEM (2) - OUTPUT

```
   2    1    9    0    0    0    1
START PROGRAM
PLANE STRESS FINITE DEFORMATION ANALYSIS


 PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*

FOR REFERENCE, THE INPUT DECK IS REPRODUCED IN ITS ENTIRETY

    SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION
     6     4     2     1     1     0     1
     1  2  3     1  3  4
 0.0000 0.0000  1.0000 0.0000  1.0000 1.5000  0.0000 1.5000
          03.10000000E+01       00.10000000E+01       0.E+00                0.E+00
     4     4     0     1     0     4
      3     6     8     5
0.7100E-02 0.1050E-01 0.1050E-01 0.7100E-02 0.1000E-01 0.1000E-01 0.1000E-01 0.1000E-01
     1     2     4     7
                       00.30000000E+00              00.10000000E+07              -0.E+00
  1     3
.E+00       0.47140E+04 0.70711E+00 0.51854E+05 0.14142E+01 0.98995E+05
     2     4     6     8
      0
                                    1  0.50000E-01 0.10000E-01

 PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*PLANE PROBLEM*



STATE MAP  STEP    1 -     1

   2   2
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                    STEP   1-   1 OF   2
                                        GEOMETRY  SUMMARY
                          ELE          NODES                  COORDINATES

                           N      N1    N2   N3      XN1        YN1        XN2        YN2        XN3        YN3

                           1      1     2     3   0.00000    0.00000    1.00000    0.00000    1.00000    1.50000
                           2      1     3     4   0.00000    0.00000    1.00000    1.50000    0.00000    1.50000
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                    STEP   1-   1 OF   2
                                        PROBLEM SUMMARY
                                                 Y

                              NEL=    2   NZC=    4   NINC=    2  YMD=10.00000E+05    RKAP= 83.33325E+04
                              NRD=    8   NDC=    4               GMD=38.46154E+04
                              IBD=    8   NFC=    0               PRT=0.30000
                                                                  SIGEO YIELD=   4714.05
```

TABLE IV. - Continued. SAMPLE PROBLEM (2) - OUTPUT

```
                                THIS IS INCREMENT     1 OF     2

ZERO DISPLACEMENT DEGREES OF FREEDOM ARE      1     2     4     7     0     0     0     0     0     0
ZERO DISPLACEMENT DEGREES OF FREEDOM ARE      1     2     4     7

DISPLACEMENT BOUNDED DEGREES OF FREEDOM ARE

NDP(I)=         3     6     8     5
DU=  0.00001 0.00002 0.00002 0.00001
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-
THE APPLIED LOAD AT STEP  1-   1 IS      0.29104E-10
THE INC. LOAD IS     0.29104E-10
SCALED STEP
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                          STEP   1-   1 OF   2
                                        NODAL DATA
NODE       COORDINATES                  DISPLACEMENTS                                FORCES
 N    X COORD    Y COORD      UX          UY          DUX         DUY          FX          FY          DFX         DFY        N
 1    0.0000     0.0000    0.000000    0.000000    0.000000    0.000000  -0.75846E+04  -0.50436E+04  -0.75846E+04  -0.50436E+04   1
 2    1.0071     0.0000    0.007087    0.000000    0.007087    0.000000   0.75846E+04  -0.50436E+04   0.75846E+04  -0.50436E+04   2
 3    1.0071     1.5106    0.007087    0.010580    0.007087    0.010580   0.75846E+04   0.50436E+04   0.75846E+04   0.50436E+04   3
 4    0.0000     1.5106    0.000000    0.010580    0.000000    0.010580  -0.75846E+04   0.50436E+04  -0.75846E+04   0.50436E+04   4
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                          STEP   1-   1 OF   2
                                        ELEMENT DATA
ELE        ALMANSI STRAIN                    PRINCIPAL STRESS                              CAUCHY STRESS
 N  INV  EPSX    EPSY      EPSXY     LZ         S1          S2          TM        THET    SIG X       SIG Y       SIG XY      SIGEQ      EP
 1   2  0.0070  0.0070    0.0000   0.9939   0.1011E+05  0.1009E+05  0.1280E+02  0.0000  0.1011E+05  0.1009E+05  0.E+00     0.4761E+04  0.E+00
 2   2  0.0070  0.0070    0.0000   0.9939   0.1011E+05  0.1009E+05  0.1280E+02  0.0000  0.1011E+05  0.1009E+05  0.E+00     0.4761E+04  0.E+00
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-

 ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.        ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.
   1 00.71407E+02  0.E+00       00.71407E+02 00.67333E+04         2Y08.11#07E+02  0.E+00       00.71407E+02 00.67333E+04

THE ELASTIC ENERGY IS          00.107972E+03
TGD OK+/THB DMDUFY H/          A<DIAA
THE TOTAL ENERGY IS      00.107972E+03FOR A LOAD OF      00.291038E-10

STATE MAP  STEP    1 -     2

THE APPLIED LOAD AT STEP  1-   2 IS      0.29104E-10
THE INC. LOAD IS     -.42633E-13
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                          STEP   1-   2 OF   2
                                        NODAL DATA
```

TABLE IV. - Continued. SAMPLE PROBLEM (2) - OUTPUT

```
NODE       COORDINATES                    DISPLACEMENTS                                                    FORCES

 N     X COORD    Y COORD      UX            UY            DUX           DUY            FX            FY            DFX           DFY          N

   1   0.0000     0.0000    0.000000      0.000000      0.000000      0.000000   -0.75862E+04  -0.50447E+04  -0.16507E+01  -0.11111E+01      1
   2   1.0071     0.0000    0.007100      0.000000      0.000011      0.000000    0.75862E+04  -0.50447E+04   0.16507E+01   0.11111E+01      2
   3   1.0071     1.5106    0.007100      0.010600      0.000013      0.000020    0.75862E+04   0.50447E+04   0.16507E+01   0.11111E+01      3
Y  4   0.0000     1.5106    0.000000      0.010600      0.000000      0.000020   -0.75862E+04   0.50447E+04  -0.16507E+01   0.11111E+01      4
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                                        STEP   1-   2 OF   2
                                                ELEMENT DATA

ELE        ALMANSI STRAIN                       PRINCIPAL STRESS                                          CAUCHY STRESS

  N IRV EPSX  EPSY      EPSXY      LZ          S1            S2            TM          THET      SIG X         SIG Y         SIG XY        SIGEQ        EP

  1 3 0.0070 0.0070 0.0000 0.9939 0.1012E+05 0.1009E+05 0.1279E+02 0.0000 0.1012E+05 0.1009E+05 0.E+00      0.4762E+04 0.1644E-04
Y    8.80 0Y0.0070 0.0000 0.9939 0.1012E+05 0.1009E+05 0.1279E+02 0.0000 0.1012E+05 0.1009E+05 0.E+00      0.4762E+04 0.1644E-04
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-


 ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.          ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.
   1 00.71440E+02 00.23489E+00 00.71675E+02 00.67349E+04            2 00.71440E+02 00.23489E+00 00.71675E+02 00.67349E+04


THE ELASTIC ENERGY IS          00.108022E+03
THE PLASTIC ENERGY IS          00.355173E+00
THE TOTAL ENERGY IS      00.108377E+03FOR A LOAD OF      00.291038E-10


STATE MAP  STEP    2 -     1


    3    3
THE APPLIED LOAD AT STEP  2-   1 IS      0.58208E-10
THE INC. LOAD IS     0.67075E-11
SCALED STEP
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                                        STEP   2-   1 OF   2
                                                NODAL DATA

NODE       COORDINATES                    DISPLACEMENTS                                                    FORCES

 N     X COORD    Y COORD      UX            UY            DUX           DUY            FX            FY            DFX           DFY          N

   1   0.0000     0.0000    0.000000      0.000000      0.000000      0.000000   -0.81841E+04  -0.50661E+04  -0.59789E+03  -0.21393E+02      1
   2   1.0192     0.0000    0.010192      0.000000      0.003052      0.000000    0.81841E+04  -0.50661E+04   0.59789E+03  -0.21393E+02      2
   3   1.0192     1.5137    0.010192      0.013652      0.003052      0.003052    0.81841E+04   0.50661E+04   0.59789E+03   0.21393E+02      3
   4   0.0000     1.5137    0.000000      0.013652      0.000000      0.003052   -0.81841E+04   0.50661E+04  -0.59789E+03   0.21393E+02      4
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                                        STEP   2-   1 OF   2
                                                ELEMENT DATA
```

TABLE IV. - Continued. SAMPLE PROBLEM (2) - OUTPUT

```
ELE          ALMANSI STRAIN                          PRINCIPAL STRESS                                        CAUCHY STRESS

  N IRV EPSX  EPSY      EPSXY     LZ        S1          S2          TM          THET     SIG X       SIG Y          SIG XY      SIGEQ       EP

  1 3 0.0100 0.0090 0.0000 0.9892 0.1094E+05 0.1015E+05 0.3948E+03 0.0000 0.1094E+05 0.1015E+05 0.E+00      0.4981E+04 0.3298E-02
  2 3 0.0100 0.0090 0.0000 0.9892 0.1094E+05 0.1015E+05 0.3948E+03 0.0000 0.1094E+05 0.1015E+05 0.7032E-11 0.4981E+04 0.3298E-02
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-


 ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.          ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.
   1 00.78027E+02 00.47122E+02 00.12515E+03 00.70294E+04            2 00.78027E+02 00.47122E+02 00.12515E+03 00.70294E+04


THE ELASTIC ENERGY IS          00.118022E+03
THE PLASTIC ENERGY IS          00.712762E+02
THE TOTAL ENERGY IS     00.189298E+03FOR A LOAD OF      00.582077E-10


STATE MAP  STEP    2 -    2

    3    3
THE APPLIED LOAD AT STEP  2-   2 IS     0.87311E-10
THE INC. LOAD IS    0.11369E-10
SCALED STEP
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                          STEP   2-   2 OF   2
                                                NODAL DATA
NODE       COORDINATES                  DISPLACEMENTS                                  FORCES

 N    X COORD    Y COORD     UX          UY          DUX         DUY          FX           FY          DFX          DFY        N

   1   0.0000     0.0000   0.000000    0.000000   0.000000    0.000000  -0.86965E+04  -0.51894E+04  -0.51235E+03  -0.12333E+03     1
   2   1.0137     0.0000   0.013695    0.000000   0.003544    0.000000   0.86965E+04  -0.51894E+04   0.51235E+03  -0.12333E+03     2
   3   1.0137     1.5172   0.013695    0.017195   0.003544    0.003544   0.86965E+04   0.51894E+04   0.51235E+03   0.12333E+03     3
   4   0.0000     1.5172   0.000000    0.017195   0.000000    0.003544  -0.86965E+04   0.51894E+04  -0.51235E+03   0.12333E+03     4
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                          STEP   2-   2 OF   2
                                               ELEMENT DATA

ELE          ALMANSI STRAIN                          PRINCIPAL STRESS                                        CAUCHY STRESS

  N IRV EPSX  EPSY      EPSXY     LZ        S1          S2          TM          THET     SIG X       SIG Y          SIG XY      SIGEQ       EP

  1 3 0.0134 0.0113 0.0000 0.9839 0.1166E+05 0.1042E+05 0.6207E+03 0.0000 0.1166E+05 0.1042E+05 0.E+00      0.6227E+04 0.6998E-02
  2 3 0.0134 0.0113 0.0000 0.9839 0.1166E+05 0.1042E+05 0.6207E+03 0.0000 0.1166E+05 0.1042E+05 0.3062E-11 0.6227E+04 0.6998E-02
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-
```

TABLE IV. - Concluded. SAMPLE PROBLEM (2) - OUTPUT

```
ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.          ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.
  1 00.85770E+02 00.10240E+03 00.18817E+03 00.73579E+04            2 00.85770E+02 00.10240E+03 00.18817E+03 00.73579E+04



THE ELASTIC ENERGY IS          00.129782E+03
THE PLASTIC ENERGY IS          00.154948E+03
THE TOTAL ENERGY IS      00.284730E+03FOR A LOAD OF      00.873115E-10



STATE MAP  STEP    2 -    3


    3    3
THE APPLIED LOAD AT STEP  2-   3 IS     0.14552E-09
THE INC. LOAD IS    0.29104E-10
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                    STEP   2-   3 OF   2
                                        NODAL DATA
NODE       COORDINATES                  DISPLACEMENTS                                  FORCES

 N     X COORD   Y COORD      UX          UY          DUX         DUY          FX          FY          DFX         DFY        N

   1    0.0000    0.0000   0.000000    0.000000   0.000000    0.000000  -0.91094E+04  -0.53646E+04  -0.41293E+03  -0.17515E+03     1
   2    1.0171    0.0000   0.017100    0.000000   0.003405    0.000000   0.91094E+04  -0.53646E+04   0.41293E+03  -0.17515E+03     2
   3    1.0171    1.5206   0.017100    0.020600   0.003405    0.003405   0.91094E+04   0.53646E+04   0.41293E+03   0.17515E+03     3
   4    0.0000    1.5206   0.000000    0.020600   0.000000    0.003405  -0.91094E+04   0.53646E+04  -0.41293E+03   0.17515E+03     4
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-
SAMPLE PROBLEM  2  PLANE STRESS BIAXIAL EXTENSION                    STEP   2-   3 OF   2
                                        ELEMENT DATA
ELE          ALMANSI STRAIN                    PRINCIPAL STRESS                                  CAUCHY STRESS

 N IRV EP X  EP Y      EPSXY     LZ        S1          S2          TM        THET     SIG X       SIG Y        SIG XY      SIGEQ       EP

  1 3 0.0167 0.0135-0.0000 0.9787 0.1225E+05 0.1079E+05 0.7294E+03 0.0000 0.1225E+05 0.1079E+05-0.3463E-11 0.5461E+04 0.1051E-01
  2 3 0.0167 0.0135 0.0000 0.9787 0.1225E+05 0.1079E+05 0.7294E+03 0.0000 0.1225E+05 0.1079E+05 0.1483E-11 0.5461E+04 0.1051E-01
-PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS--PLANE STRESS-



ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.          ELE  EL. EN. DEN  PLS EN. DEN  TOT EN. DEN HYDRO. TENS.
  1 00.93532E+02 00.15748E+03 00.25101E+03 00.76777E+04            2 00.93532E+02 00.15748E+03 00.25101E+03 00.76777E+04



THE ELASTIC ENERGY IS          00.141578E+03
THE PLASTIC ENERGY IS          00.238378E+03
THE TOTAL ENERGY IS      00.379956E+03FOR A LOAD OF      00.145519E-09
```

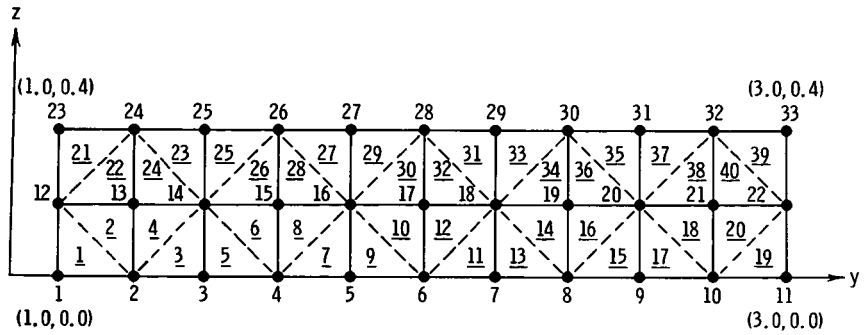

Figure 6. - Undeformed finite-element model sample problems (3) and (4).
(Node numbers, i; element numbers, i.)

TABLE V. - SAMPLE PROBLEM (3) - INPUT

STATEMENT NUMBER	CONT.	FORTRAN STATEMENT	IDENTIFICATION
2		0 1 0 1 1 5 0	
1		3 0 0 1	
FIPAX SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE			
26		6.6 4.0 1 0 0	
1	2	1.2 2.13 12 2 3.14 2.14 13 3.4.14 4 15.14 4 5 16	4.16.15
5	6	1.6 6.17 16 6 7.18 6.18 17 7.8.18 8 19.18 8 9 20	8.20.19
9	10	2.0 10.21 20 10 11.22 10.22 21 1 2.24.23 12 13.24 14 25 24	13.14.24
14	26	2.5 14.15 26 16 27.26 15.16 26 1 6.28.27 16 17.28 18 29 28	17.18.28
18	30	2.9 18.19 30 20 31.30 19.20 30 2 0.32.31 20 21.32 22 33 32	21.22.32
	1.0	0.0 1.2 0.0 1.4 0.0 1.6 0.0 1.8	0.0
	2.0	0.0 2.2 0.0 2.4 0.0 2.6 0.0 2.8	0.0
	3.0	0.0 1.0 0.2 1.2 0.2 1.4 0.2 1.6	0.2
	1.8	0.2 2.0 0.2 2.2 0.2 2.4 0.2 2.6	0.2
	2.8	0.2 3.0 0.2 1.0 0.4 1.2 0.4 1.4	0.4
	1.6	0.4 1.8 0.4 2.0 0.4 2.2 0.4 2.4	0.4
	2.6	0.4 2.8 0.4 3.0 0.4	
	1.0	1.0 0.0 0.0	
3		11 0 0 0 3	
1		23 45	
0.005		0.005	
2		4 6 8 10 12 14 16 18 20 22	
		0 3 100000.0	
0		3	
		10000.0 -0.1	
		110000.0 1.0	
		210000.0 2.0	
1		23 45	
0			

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TABLE VI. - SAMPLE PROBLEM (3) - OUTPUT

```
 2    0    1    0    1    1    5    0
 1    3    0    0    1
FINITE DEFORMATION ANALYSIS

+AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC+

FOR REFERENCE, THE INPUT DECK IS REPRODUCED IN ITS ENTIRETY

    SAMPLE PROBLEM  3  EXPANSION OF A THICK WALL TUBE
    26    66    40     1     0     0
     1   2  12       2  13  12       2   3  14       2  14  13       3   4  14       4  15  14       4   5  16       4  16  15
     5   6  16       6  17  16       6   7  18       6  18  17       7   8  18       8  19  18       8   9  20       8  20  19
     9  10  20      10  21  20      10  11  22      10  22  21      12  24  23      12  13  24      14  25  24      13  14  24
    14  26  25      14  15  26      16  27  26      15  16  26      16  28  27      16  17  28      18  29  28      17  18  28
    18  30  29      18  19  30      20  31  30      19  20  30      20  32  31      20  21  32      22  33  32      21  22  32
 1.0000 0.0000  1.2000 0.0000  1.4000 0.0000  1.6000 0.0000  1.8000 0.0000  2.0000 0.0000  2.2000 0.0000  2.4000 0.0000
 2.6000 0.0000  2.8000 0.0000  3.0000 0.0000  1.0000 0.2000  1.2000 0.2000  1.4000 0.2000  1.6000 0.2000  1.8000 0.2000
 2.0000 0.2000  2.2000 0.2000  2.4000 0.2000  2.6000 0.2000  2.8000 0.2000  3.0000 0.2000  1.0000 0.4000  1.2000 0.4000
 1.4000 0.4000  1.6000 0.4000  1.8000 0.4000  2.0000 0.4000  2.2000 0.4000  2.4000 0.4000  2.6000 0.4000  2.8000 0.4000
 3.0000 0.4000
              00.10000000E+01      00.10000000E+01       0.E+00              0.E+00
    3    11     0     0     0     3
     1      23      45
 0.5000E-02 0.5000E-02
     2          4          6          8         10         12         14         16         18         20
    22
                            00.30000000E+00                  00.10000000E+07                  -0.E+00
   3    0
  00.1000000000E+05   -0.1000000000E+00
  00.1100000000E+06   00.1000000000E+01
  00.2100000000E+06   00.2000000000E+01
     1     23     45
     0

+AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC++AXISYMMETRIC+
START FROM CARDS

STATE MAP  STEP      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
SAMPLE PROBLEM  3  EXPANSION OF A THICK WALL TUBE                                                  STEP    1 -    1 OF    2
```

GEOMETRY SUMMARY

ELE N	NODES N1	N2	N3	COORDINATES RN1	ZN1	RN2	ZN2	RN3	ZN3
1	1	2	12	1.00000	0.00000	1.20000	0.00000	1.00000	0.20000
2	2	13	12	1.20000	0.00000	1.20000	0.20000	1.00000	0.20000
3	2	3	14	1.20000	0.00000	1.40000	0.00000	1.40000	0.20000
4	2	14	13	1.20000	0.00000	1.40000	0.20000	1.20000	0.20000
5	3	4	14	1.40000	0.00000	1.60000	0.00000	1.40000	0.20000
6	4	15	14	1.60000	0.00000	1.60000	0.20000	1.40000	0.20000
7	4	5	16	1.60000	0.00000	1.80000	0.00000	1.80000	0.20000
8	4	16	15	1.60000	0.00000	1.80000	0.20000	1.60000	0.20000
9	5	6	16	1.80000	0.00000	2.00000	0.00000	1.80000	0.20000
10	6	17	16	2.00000	0.00000	2.00000	0.20000	1.80000	0.20000
11	6	7	18	2.00000	0.00000	2.20000	0.00000	2.20000	0.20000
12	6	18	17	2.00000	0.00000	2.20000	0.20000	2.00000	0.20000
13	7	8	18	2.20000	0.00000	2.40000	0.00000	2.20000	0.20000
14	8	19	18	2.40000	0.00000	2.40000	0.20000	2.20000	0.20000
15	8	9	20	2.40000	0.00000	2.60000	0.00000	2.60000	0.20000
16	8	20	19	2.40000	0.00000	2.60000	0.20000	2.40000	0.20000
17	9	10	20	2.60000	0.00000	2.80000	0.00000	2.60000	0.20000
18	10	21	20	2.80000	0.00000	2.80000	0.20000	2.60000	0.20000
19	10	11	22	2.80000	0.00000	3.00000	0.00000	3.00000	0.20000
20	10	22	21	2.80000	0.00000	3.00000	0.20000	2.80000	0.20000
21	12	24	23	1.00000	0.20000	1.20000	0.40000	1.00000	0.40000
22	12	13	24	1.00000	0.20000	1.20000	0.20000	1.20000	0.40000
23	14	25	24	1.40000	0.20000	1.40000	0.40000	1.20000	0.40000
24	13	14	24	1.20000	0.20000	1.40000	0.20000	1.20000	0.40000
25	14	26	25	1.40000	0.20000	1.60000	0.40000	1.40000	0.40000
26	14	15	26	1.40000	0.20000	1.60000	0.20000	1.60000	0.40000
27	16	27	26	1.80000	0.20000	1.80000	0.40000	1.60000	0.40000
28	15	16	26	1.60000	0.20000	1.80000	0.20000	1.60000	0.40000
29	16	28	27	1.80000	0.20000	2.00000	0.40000	1.80000	0.40000
30	16	17	28	1.80000	0.20000	2.00000	0.20000	2.00000	0.40000
31	18	29	28	2.20000	0.20000	2.20000	0.40000	2.00000	0.40000
32	17	18	28	2.00000	0.20000	2.20000	0.20000	2.00000	0.40000
33	18	30	29	2.20000	0.20000	2.40000	0.40000	2.20000	0.40000
34	18	19	30	2.20000	0.20000	2.40000	0.20000	2.40000	0.40000
35	20	31	30	2.60000	0.20000	2.60000	0.40000	2.40000	0.40000
36	19	20	30	2.40000	0.20000	2.60000	0.20000	2.40000	0.40000
37	20	32	31	2.60000	0.20000	2.80000	0.40000	2.60000	0.40000
38	20	21	32	2.60000	0.20000	2.80000	0.20000	2.80000	0.40000
39	22	33	32	3.00000	0.20000	3.00000	0.40000	2.80000	0.40000
40	21	22	32	2.80000	0.20000	3.00000	0.20000	2.80000	0.40000

TABLE VI. - Continued. SAMPLE PROBLEM (3) - OUTPUT

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 1 - 1 OF 2

PROBLEM SUMMARY

NEL= 40 NZC= 11 NINC= 2 YMD=10.00000E+05 PKAP= 25.00000E+05
NRD= 66 NDC= 3 GMD=3d.4n15+E+04
IBD= 26 NFC= 0 PRT=0.30000
SIGEQ YIELD= 10000.00

ZERO DISPLACEMENT DEGREES OF FREEDOM ARE 2 4 6 8 10 12 14 16 18 20 22

DISPLACEMENT BOUNDED DEGREES OF FREEDOM ARE

N= 1 23 45
DU= 0.00500

TOTAL DISPLACEMENTS

0.00500000	0.00000000	0.00425183	0.00000000	0.00377409	0.00000000	0.00339637	0.00000000	0.00313603	0.00000000
0.00292355	0.00000000	0.00277101	0.00000000	0.00264478	0.00000000	0.00255317	0.00000000	0.00247751	0.00000000
0.00242378	0.00000000	0.00500000	-.00005279	0.00429385	-.00004698	0.00376076	-.00004830	0.00340974	-.00004861
0.00312825	-.00004868	0.00292979	-.00004871	0.00276652	-.00004858	0.00264832	-.00004859	0.00255043	-.00004852
0.00247978	-.00004860	0.00242190	-.00004875	0.00500000	-.00010895	0.00425163	-.00009199	0.00377480	-.00009713
0.00339692	-.00009731	0.00313627	-.00009720	0.00292359	-.00009747	0.00277099	-.00009711	0.00264477	-.00009721
0.00255323	-.00009705	0.00247767	-.00009718	0.00242401	-.00009758				

HMBUDLDMT+R CHUK+BULDMT/

0.00500000	0.00000000	0.00425183	0.00000000	0.00377409	0.00000000	0.00339637	0.00000000	0.00313603	0.00000000
0.00292355	0.00000000	0.00277101	0.00000000	0.00264478	0.00000000	0.00255317	0.00000000	0.00247751	0.00000000
0.00242378	0.00000000	0.00500000	-.00005279	0.00429385	-.00004698	0.00376076	-.00004830	0.00340974	-.00004861
0.00312825	-.00004868	0.00292979	-.00004871	0.00276652	-.00004858	0.00264832	-.00004859	0.00255043	-.00004852
0.00247978	-.00004860	0.00242190	-.00004875	0.00500000	-.00010895	0.00425163	-.00009199	0.00377480	-.00009713
0.00339692	-.00009731	0.00313627	-.00009720	0.00292359	-.00009747	0.00277099	-.00009711	0.00264477	-.00009721
0.00255323	-.00009705	0.00247767	-.00009718	0.00242401	-.00009758				

INCREMENTAL FORCES

1917.3	-37.5	-0.0	49.0	-0.0	-12.3	0.0	-0.8	-0.0	1.7
-0.0	-1.8	-0.0	2.1	-0.0	-1.5	-0.0	1.4	-0.0	00.8
00.0	-1.1	4282.0	-0.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
0.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	00.0	00.0
-0.0	-0.0	00.0	00.0	1940.2	-0.0	-0.0	-0.0	-0.0	-0.0
0.0	-0.0	00.0	-0.0	00.0	00.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

TOTAL FORCES

1917.3	-37.5	-0.0	49.0	-0.0	-12.3	0.0	-0.8	-0.0	1.7
-0.0	-1.8	-0.0	2.1	-0.0	-1.5	-0.0	1.4	-0.0	00.8
00.0	-1.1	4282.0	-0.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
0.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	00.0	00.0
-0.0	-0.0	00.0	00.0	1940.2	-0.0	-0.0	-0.0	-0.0	-0.0
0.0	-0.0	00.0	-0.0	00.0	00.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

NODAL COORDINATES

1.000000	0.000000	1.204252	0.000000	1.403774	0.000000	1.603396	0.000000	1.803136	0.000000
2.002424	0.000000	2.202771	0.000000	2.402645	0.000000	2.602553	0.000000	2.802478	0.000000
3.002424	0.000000	1.005000	00.199947	1.204294	00.199953	1.403761	00.199952	1.603410	00.199951
1.803128	00.199951	2.002930	00.199951	2.202767	00.199951	2.402648	00.199951	2.602550	00.199951
2.802480	00.199951	3.002422	00.199951	1.005000	00.399891	1.204252	00.399908	1.403775	00.399903
1.603397	00.399903	1.803136	00.399903	2.002924	00.399903	2.202771	00.399903	2.402645	00.399903
2.602553	00.399903	2.802478	00.399903	3.002424	00.399902				

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 1 - 1 OF 2

STRESS ELEMENT DATA

NEL	IRV	SR	ST	SZ	SRZ	S1	S2	S12	TS	SIGEQ	S	J2	J3
1	1-0.2619E+04	0.3685E+04	0.5595E+02	0.E+00	0.5595E+02	-0.2619E+04	0.1337E+040.00	0.5480E+04	0.3741E+03	0.1001E+08	0.3152E+10		
2	1-0.2593E+04	0.3141E+04	-0.5471E+02	0.9198E+02	-0.5138E+02	-0.2593E+04	0.1271E+040.04	0.5021E+04	0.1820E+03	0.8396E+07	0.1974E+10		
3	1-0.1655E+04	0.2449E+04	-0.3206E+01	-0.2564E+02	-0.2808E+01	-0.1655E+04	0.8262E+030.02	0.3577E+04	0.2037E+03	0.4264E+07	0.1119E+10		
4	1-0.1859E+04	0.2686E+04	0.1440E+02	0.7827E+02	0.1767E+02	-0.1859E+04	0.9381E+030.04	0.3956E+04	0.2618E+03	0.5210E+07	0.1374E+10		
5	1-0.1244E+04	0.2115E+04	0.1459E+02	-0.2564E+02	0.1911E+02	-0.1244E+04	0.6340E+030.02	0.2943E+04	0.2952E+03	0.2486E+07	0.7772E+09		
6	1-0.1178E+04	0.1940E+04	-0.1447E+02	0.2512E+02	-0.1393E+02	-0.1178E+04	0.5821E+030.02	0.2729E+04	0.2492E+03	0.2481E+07	0.6358E+09		
7	1-0.8209E+03	0.1610E+04	-0.6417E+01	-0.1497E+02	-0.6542E+01	-0.8212E+03	0.4073E+030.02	0.2143E+04	0.2606E+03	0.1530E+07	0.3901E+09		
8	1-0.8887E+03	0.1722E+04	0.7045E+01	0.2559E+02	0.7775E+01	-0.8894E+03	0.4486E+030.03	0.2299E+04	0.2803E+03	0.1760E+07	0.4606E+09		
9	1-0.6243E+03	0.1455E+04	0.5956E+01	-0.1497E+02	0.6321E+01	-0.6244E+03	0.3154E+030.02	0.1847E+04	0.2791E+03	0.1137E+07	0.2901E+09		
10	1-0.5829E+03	0.1372E+04	-0.6953E+01	0.1194E+02	-0.6706E+01	-0.5831E+03	0.2842E+030.02	0.1740E+04	0.2606E+03	0.1009E+07	0.2507E+09		
11	1-0.4041E+03	0.1200E+04	-0.4246E+01	-0.8624E+01	-0.4104E+01	-0.4043E+03	0.2001E+030.02	0.1446E+04	0.2637E+03	0.6968E+06	0.1675E+09		
12	1-0.4377E+03	0.1260E+04	0.3769E+01	0.1225E+02	0.3609E+01	-0.4377E+03	0.2206E+030.03	0.1526E+04	0.2753E+03	0.7756E+06	0.1909E+09		
13	1-0.2956E+03	0.1116E+04	0.3084E+01	-0.8624E+01	0.3333E+01	-0.2956E+03	0.1496E+030.03	0.1288E+04	0.2744E+03	0.5530E+06	0.1300E+09		
14	1-0.2715E+03	0.1064E+04	-0.3780E+01	0.6792E+01	-0.3608E+01	-0.2717E+03	0.1340E+030.03	0.1229E+04	0.2695E+03	0.5031E+06	0.1157E+09		
15	1-0.1683E+03	0.9682E+03	-0.2606E+01	-0.5274E+01	-0.2441E+01	-0.1685E+03	0.8304E+020.03	0.1063E+04	0.2656E+03	0.3770E+06	0.8184E+08		
16	1-0.1479E+03	0.1004E+04	0.2655E+01	0.6962E+01	0.2311E+01	-0.1478E+03	0.9506E+020.04	0.1104E+04	0.2729E+03	0.4102E+06	0.9122E+08		
17	1-0.1025E+03	0.9175E+03	0.1904E+01	-0.5274E+01	0.2170E+01	-0.1028E+03	0.5248E+020.05	0.9720E+03	0.2723E+03	0.3149E+06	0.6938E+08		
18	1-0.8744E+02	0.8885E+03	-0.2691E+01	0.4213E+01	-0.2483E+01	-0.8769E+02	0.4260E+020.05	0.9365E+03	0.2661E+03	0.2923E+06	0.5916E+08		
19	1-0.2217E+02	0.8244E+03	-0.3030E+01	-0.3617E+01	-0.2370E+01	-0.2284E+02	0.1024E+020.18	0.8374E+03	0.2665E+03	0.2337E+06	0.4342E+08		
20	1-0.3479E+02	0.8479E+03	0.9240E+00	0.4085E+01	0.1385E+01	-0.3525E+02	0.1432E+020.11	0.8654E+03	0.2713E+03	0.2496E+06	0.4773E+08		
21	1-0.2631E+04	0.3679E+04	0.3282E+02	0.3252E+02	0.3302E+02	-0.2630E+04	0.1332E+040.01	0.5482E+04	0.3591E+03	0.1002E+08	0.3236E+10		
22	1-0.2584E+04	0.3196E+04	-0.4146E+02	-0.7003E+02	-0.3953E+02	-0.2586E+04	0.1273E+040.03	0.5020E+04	0.1902E+03	0.8394E+07	0.1932E+10		
23	1-0.1655E+04	0.2451E+04	-0.4023E+01	0.1712E+02	-0.3845F+01	-0.1650E+04	0.8233E+030.01	0.3574E+04	0.2654E+03	0.4256E+07	0.1124E+10		
24	1-0.1859E+04	0.2692E+04	0.2765E+02	-0.8374E+02	0.3138E+02	-0.1853E+04	0.9424E+030.04	0.3955E+04	0.2900E+03	0.5208E+07	0.1344E+10		
25	1-0.1251E+04	0.2114E+04	0.1476E+02	0.2867E+02	0.1532E+02	-0.1251E+04	0.6334E+030.02	0.2944E+04	0.2926E+03	0.2498E+07	0.7809E+09		
26	1-0.1178E+04	0.1933E+04	-0.1445E+02	-0.2527E+02	-0.1440E+02	-0.1178E+04	0.5819E+030.02	0.2729E+04	0.2689E+03	0.2481E+07	0.6364E+09		
27	1-0.8224E+03	0.1609E+04	-0.6555E+01	0.1554E+02	-0.6255E+01	-0.8227E+03	0.4082E+030.02	0.2144E+04	0.2601E+03	0.1532E+07	0.3893E+09		
28	1-0.8884E+03	0.1722E+04	0.6956E+01	-0.2490E+02	0.7244E+01	-0.8895E+03	0.4484E+030.03	0.2299E+04	0.2800E+03	0.1761E+07	0.4610E+09		
29	1-0.6244E+03	0.1455E+04	0.6479E+01	0.1491E+02	0.6831E+01	-0.6252E+03	0.3160E+030.02	0.1847E+04	0.2789E+03	0.1137E+07	0.2897E+09		
30	1-0.5839E+03	0.1371E+04	-0.7278E+01	-0.1194E+02	-0.7029E+01	-0.5833E+03	0.2851E+030.02	0.1740E+04	0.2604E+03	0.1009E+07	0.2508E+09		
31	1-0.4044E+03	0.1200E+04	-0.4076E+01	0.9302E+01	-0.3660E+01	-0.4046E+03	0.2004E+030.02	0.1446E+04	0.2637E+03	0.6965E+06	0.1674E+09		
32	1-0.4376E+03	0.1260E+04	0.2744E+01	-0.1167E+02	0.3253E+01	-0.4378E+03	0.2205E+030.03	0.1526E+04	0.2752E+03	0.7759E+06	0.1910E+09		
33	1-0.2954E+03	0.1116E+04	0.1479E+01	0.8345E+01	0.3714E+01	-0.2956E+03	0.1497E+030.03	0.1288E+04	0.2746E+03	0.5529E+06	0.1300E+09		

TABLE VI. - Continued. SAMPLE PROBLEM (3) - OUTPUT

34	1-0.271ME+03	0.1064E+04-0.3454E+01-0.6451E+01-0.3778E+01-0.2718E+03				0.1340E+030.03		0.1229E+04	0.2644E+03	0.5031E+06	0.1157E+09		
35	1-0.167ME+03	0.9866E+03-0.2521E+01 0.5701E+01-0.2325E+01-0.1681E+03				0.8290E+020.03		0.1063E+04	0.2660E+03	0.3769E+06	0.8184E+08		
36	1-0.1M7ME+03	0.1004E+04 0.1882E+01-0.6651E+01 0.2118E+01-0.1M79E+03				0.9499E+020.04		0.1104E+04	0.2728E+03	0.4102E+06	0.9124E+08		
37	1-0.1014E+03	0.9177E+03 0.2104E+01 0.5173E+01 0.2355E+01-0.1021E+03				0.5224E+020.05		0.9718E+03	0.2727E+03	0.3148E+06	0.6537E+08		
38	1-0.8742E+02	0.8848E+03-0.2554E+01-0.4235E+01-0.2349E+01-0.8763E+02				0.4264E+020.05		0.9365E+03	0.2662E+03	0.2923E+06	0.5715E+08		
39	1-0.218ME+02	0.8247E+03-0.3302E+01 0.3302E+01-0.2732E+01-0.2243E+02				0.9850E+010.17		0.8374E+03	0.2665E+03	0.2339E+06	0.4343E+08		
40	1-0.3471E+02	0.8448E+03 0.1055E+01-0.4303E+01 0.1580E+01-0.3525E+02				0.1342E+020.12		0.8054E+03	0.2714E+03	0.2496E+06	0.4772E+08		

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 1 - 1 OF 2

STRAIN ELEMENT DATA

NEL	RC	ZC	ER	ET	EZ	ERZ	LR	LZ	LT	L1	L2	TL	TS	TR	EPEQ	NEL
1	1.07142	00.06665	-0.00376	0.00442	-0.00026	0.00000	0.9963	0.9997	1.0045	0.9997	0.9963	0.00	-0.00	00.00	0.00000	1
2	1.13785	00.13330	-0.00355	0.00396	-0.00024	0.00012	0.9965	0.9998	1.0040	0.9998	0.9965	0.00	00.00	00.00	0.00000	2
3	1.33726	00.06665	-0.00240	0.00293	-0.00024	-0.00003	0.9976	0.9998	1.0029	0.9998	0.9976	3.13	-0.00	00.00	0.00000	3
4	1.27077	00.13330	-0.00268	0.00322	-0.00024	0.00010	0.9973	0.9998	1.0032	0.9998	0.9973	0.00	00.00	00.00	0.00000	4
5	1.47031	00.06665	-0.00189	0.00248	-0.00024	-0.00003	0.9981	0.9998	1.0025	0.9998	0.9981	3.12	-0.00	00.00	0.00000	5
6	1.53666	00.13330	-0.00176	0.00229	-0.00024	0.00003	0.9982	0.9998	1.0023	0.9998	0.9982	0.00	00.00	00.00	0.00000	6
7	1.73655	00.06665	-0.00130	0.00185	-0.00024	-0.00002	0.9987	0.9998	1.0019	0.9998	0.9987	3.12	-0.00	00.00	0.00000	7
8	1.66998	00.13330	-0.00141	0.00198	-0.00024	0.00003	0.9986	0.9998	1.0020	0.9998	0.9986	0.00	00.00	00.00	0.00000	8
9	1.86973	00.06665	-0.00106	0.00164	-0.00024	-0.00002	0.9989	0.9998	1.0016	0.9998	0.9989	3.12	-0.00	00.00	0.00000	9
10	1.93633	00.13330	-0.00099	0.00154	-0.00024	0.00002	0.9990	0.9998	1.0015	0.9998	0.9990	0.00	00.00	00.00	0.00000	10
11	2.13615	00.06665	-0.00076	0.00132	-0.00024	-0.00001	0.9992	0.9998	1.0013	0.9998	0.9992	3.12	-0.00	00.00	0.00000	11
12	2.06954	00.13330	-0.00082	0.00139	-0.00024	0.00002	0.9992	0.9998	1.0014	0.9998	0.9992	0.00	00.00	00.00	0.00000	12
13	2.26939	00.06665	-0.00063	0.00120	-0.00024	-0.00001	0.9994	0.9998	1.0012	0.9998	0.9994	3.11	-0.00	00.00	0.00000	13
14	2.33602	00.13330	-0.00059	0.00115	-0.00024	0.00001	0.9994	0.9998	1.0012	0.9998	0.9994	0.00	00.00	00.00	0.00000	14
15	2.53542	00.06665	-0.00046	0.00102	-0.00024	-0.00001	0.9995	0.9998	1.0010	0.9998	0.9995	3.11	-0.00	00.00	0.00000	15
16	2.46928	00.13330	-0.00049	0.00106	-0.00024	0.00001	0.9995	0.9998	1.0011	0.9998	0.9995	0.00	00.00	00.00	0.00000	16
17	2.66919	00.06665	-0.00038	0.00095	-0.00024	-0.00001	0.9996	0.9998	1.0009	0.9998	0.9996	3.09	-0.00	00.00	0.00000	17
18	2.73584	00.13330	-0.00035	0.00091	-0.00024	0.00001	0.9996	0.9998	1.0009	0.9998	0.9995	0.00	00.00	00.00	0.00000	18
19	2.93577	00.06665	-0.00027	0.00083	-0.00024	-0.00000	0.9997	0.9998	1.0008	0.9998	0.9997	2.96	-0.00	00.00	0.00000	19
20	2.86913	00.13330	-0.00029	0.00086	-0.00024	0.00001	0.9997	0.9998	1.0009	0.9998	0.9997	0.00	00.00	00.00	0.00000	20
21	1.0714-2	00.33325	-0.00376	0.00442	-0.00026	0.00004	0.9963	0.9997	1.0045	0.9997	0.9963	0.00	00.00	00.00	0.00000	21
22	1.13785	00.26660	-0.00355	0.00396	-0.00023	-0.00009	0.9965	0.9998	1.0040	0.9998	0.9965	3.11	-0.00	00.00	0.00000	22
23	1.33726	00.33325	-0.00234	0.00243	-0.00024	0.00002	0.9976	0.9998	1.0029	0.9998	0.9976	0.00	00.00	00.00	0.00000	23
24	1.27077	00.26660	-0.00268	0.00322	-0.00023	-0.00011	0.9973	0.9998	1.0032	0.9998	0.9973	3.10	-0.00	00.00	0.00000	24
25	1.47031	00.33325	-0.00189	0.00248	-0.00024	0.00003	0.9981	0.9998	1.0025	0.9998	0.9981	0.00	00.00	00.00	0.00000	25
26	1.53666	00.26660	-0.00176	0.00229	-0.00024	-0.00003	0.9982	0.9998	1.0023	0.9998	0.9982	3.12	-0.00	00.00	0.00000	26
27	1.73655	00.33325	-0.00131	0.00185	-0.00024	0.00002	0.9987	0.9998	1.0019	0.9998	0.9987	0.00	00.00	00.00	0.00000	27
28	1.66998	00.26660	-0.00141	0.00198	-0.00024	-0.00003	0.9986	0.9998	1.0020	0.9998	0.9986	3.11	-0.00	00.00	0.00000	28
29	1.86973	00.33325	-0.00107	0.00164	-0.00024	0.00002	0.9989	0.9998	1.0016	0.9998	0.9989	0.00	00.00	00.00	0.00000	29
30	1.93633	00.26660	-0.00099	0.00154	-0.00024	-0.00002	0.9990	0.9998	1.0015	0.9998	0.9990	3.12	-0.00	00.00	0.00000	30
31	2.13615	00.33325	-0.00076	0.00132	-0.00024	0.00001	0.9992	0.9998	1.0013	0.9998	0.9992	0.00	00.00	00.00	0.00000	31
32	2.06954	00.26660	-0.00082	0.00139	-0.00024	-0.00002	0.9992	0.9998	1.0014	0.9998	0.9992	3.12	-0.00	00.00	0.00000	32
33	2.26939	00.33325	-0.00063	0.00120	-0.00024	0.00001	0.9994	0.9998	1.0012	0.9998	0.9994	0.00	00.00	00.00	0.00000	33
34	2.33602	00.26660	-0.00059	0.00115	-0.00024	-0.00001	0.9994	0.9998	1.0012	0.9998	0.9994	3.12	-0.00	00.00	0.00000	34
35	2.53542	00.33325	-0.00046	0.00102	-0.00024	0.00001	0.9995	0.9998	1.0010	0.9998	0.9995	0.00	00.00	00.00	0.00000	35
36	2.46928	00.26660	-0.00049	0.00106	-0.00024	-0.00001	0.9995	0.9998	1.0011	0.9998	0.9995	3.11	-0.00	00.00	0.00000	36
37	2.66919	00.33325	-0.00038	0.00095	-0.00024	0.00001	0.9996	0.9998	1.0009	0.9998	0.9996	0.00	00.00	00.00	0.00000	37
38	2.73584	00.26660	-0.00035	0.00091	-0.00024	-0.00001	0.9996	0.9998	1.0009	0.9998	0.9995	3.09	-0.00	00.00	0.00000	38
39	2.93577	00.33325	-0.00027	0.00083	-0.00024	0.00000	0.9997	0.9998	1.0008	0.9998	0.9997	0.00	00.00	00.00	0.00000	39
40	2.86913	00.26660	-0.00029	0.00086	-0.00024	-0.00001	0.9997	0.9998	1.0009	0.9998	0.9997	3.02	-0.00	00.00	0.00000	40

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.	ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
1	00.13096E+02	0.E+00	00.13096E+02	00.37408E+03	2	00.10945E+02	0.E+00	00.10945E+02	00.15198E+03
3	00.55863E+01	0.E+00	00.55863E+01	00.26373E+03	4	00.68287E+01	0.E+00	00.68287E+01	00.28161E+03
5	00.38052E+01	0.E+00	00.38052E+01	00.29521E+03	6	00.32636E+01	0.E+00	00.32636E+01	00.29918E+03
7	00.20305E+01	0.E+00	00.20305E+01	00.26060E+03	8	00.23365E+01	0.E+00	00.23365E+01	00.28026E+03
9	00.15249E+01	0.E+00	00.15249E+01	00.27906E+03	10	00.13522E+01	0.E+00	00.13522E+01	00.26058E+03
11	00.94764E+00	0.E+00	00.94764E+00	00.26370E+03	12	00.10542E+01	0.E+00	00.10542E+01	00.27535E+03
13	00.76415E+00	0.E+00	00.76415E+00	00.27435E+03	14	00.69604E+00	0.E+00	00.69604E+00	00.26450E+03
15	00.53248E+00	0.E+00	00.53248E+00	00.26576E+03	16	00.57796E+00	0.E+00	00.57796E+00	00.27293E+03
17	00.45391E+00	0.E+00	00.45391E+00	00.27226E+03	18	00.42256E+00	0.E+00	00.42256E+00	00.26612E+03
19	00.34648E+00	0.E+00	00.34648E+00	00.26647E+03	20	00.36871E+00	0.E+00	00.36871E+00	00.27134E+03
21	00.13049E+02	0.E+00	00.13049E+02	00.35914E+03	22	00.10940E+02	0.E+00	00.10940E+02	00.14016E+03
23	00.55786E+01	0.E+00	00.55786E+01	00.26545E+03	24	00.68299E+01	0.E+00	00.68299E+01	00.28999E+03
25	00.38059E+01	0.E+00	00.38059E+01	00.29258E+03	26	00.32639E+01	0.E+00	00.32639E+01	00.29894E+03
27	00.20320E+01	0.E+00	00.20320E+01	00.26011E+03	28	00.23366E+01	0.E+00	00.23366E+01	00.28001E+03
29	00.15256E+01	0.E+00	00.15256E+01	00.27893E+03	30	00.13522E+01	0.E+00	00.13522E+01	00.26039E+03
31	00.94778E+00	0.E+00	00.94778E+00	00.26370E+03	32	00.10542E+01	0.E+00	00.10542E+01	00.27515E+03
33	00.76413E+00	0.E+00	00.76413E+00	00.27461E+03	34	00.69604E+00	0.E+00	00.69604E+00	00.26439E+03
35	00.53243E+00	0.E+00	00.53243E+00	00.26594E+03	36	00.57795E+00	0.E+00	00.57795E+00	00.27282E+03
37	00.45388E+00	0.E+00	00.45388E+00	00.27266E+03	38	00.42257E+00	0.E+00	00.42257E+00	00.26621E+03
39	00.34651E+00	0.E+00	00.34651E+00	00.26650E+03	40	00.36873E+00	0.E+00	00.36873E+00	00.27143E+03

THE ELASTIC ENERGY IS 00.202886E+02
THE PLASTIC ENERGY IS 0.E+00
THE TOTAL ENERGY IS 00.202886E+02FOR A LOAD OF 00.814548E+04
THIS IS INCREMENT 1 - 1 OF 2
THE APPLIED LOAD IS 8145.4798THE INC. LOAD IS 8145.4798

TABLE VI. - Continued SAMPLE PROBLEM (3) - OUTPUT

STATE MAP STEP 2 - 1

```
 2  1  1  1  1  1  1  1  1  1
 1  1  1  1  1  1  1  1  1  1
 2  1  1  1  1  1  1  1  1  1
 1  1  1  1  1  1  1  1  1  1
```

TOTAL DISPLACEMENTS

0.00414392	0.00000000	0.00775691	0.00000000	0.00688435	0.00000000	0.00815729	0.00000000	0.00566837	0.00000000
0.00526929	0.00000000	0.00498294	0.00000000	0.00474658	0.00000000	0.00457616	0.00000000	0.00443668	0.00000000
0.00433806	0.00000000	0.00414392	-.00006781	0.00783101	-.00007511	0.00683588	-.00007786	0.00617658	-.00007942
0.00565019	-.00008057	0.00527785	-.00008185	0.00497118	-.00008273	0.00475024	-.00008381	0.00456747	-.00008475
0.00443697	-.00008501	0.00433064	-.00008405	0.00414392	-.00017533	0.00774706	-.00014560	0.00683941	-.00015657
0.00615074	-.00015874	0.00566333	-.00016090	0.00526327	-.00016364	0.00497791	-.00016516	0.00474070	-.00016753
0.00457041	-.00016888	0.00442922	-.00017025	0.00433108	-.00016472				

INCREMENTAL DISPLACEMENTS

0.00414392	0.00000000	0.00350509	0.00000000	0.00304026	0.00000000	0.00276092	0.00000000	0.00253234	0.00000000
0.00234574	0.00000000	0.00221193	0.00000000	0.00210180	0.00000000	0.00202299	0.00000000	0.00195918	0.00000000
0.00191424	0.00000000	0.00414392	-.00003482	0.00353716	-.00002812	0.00307512	-.00002956	0.00276864	-.00003081
0.00252194	-.00003139	0.00234806	-.00003313	0.00220466	-.00003415	0.00210192	-.00003522	0.00201704	-.00003624
0.00145719	-.00003641	0.00190874	-.00003530	0.00414392	-.00006638	0.00349543	-.00005361	0.00303460	-.00005944
0.00275382	-.00006143	0.00252705	-.00006370	0.00233968	-.00006617	0.00220692	-.00006805	0.00209593	-.00007032
0.00201718	-.00007183	0.00195155	-.00007307	0.00190707	-.00007214				

INCREMENTAL FORCES

1684.7	-21.9	-0.0	59.8	-0.0	-6.5	00.0	3.1	-0.0	3.0
-0.0	00.5	-0.0	4.6	-0.0	3.4	-0.0	3.1	-0.0	-8.1
00.0	-41.0	3763.0	0.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	0.00	-0.0	0.0	00.0	-0.0	-0.0	-0.0	00.0
00.0	-0.0	00.0	00.0	1734.3	-0.0	0.0	-0.0	0.0	-0.0
00.0	-0.0	00.0	00.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

TOTAL FORCES

3602.0	-59.4	-0.0	108.7	-0.0	-18.8	00.0	2.4	-0.0	4.7
-0.0	-1.3	-0.0	6.7	-0.0	1.9	-0.0	4.5	-0.0	-7.3
00.0	-42.1	8045.0	-0.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	-0.0	00.0
-0.0	-0.0	00.0	00.0	3685.5	-0.0	-0.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

NODAL COORDINATES

1.000144	0.000000	1.207757	0.000000	1.406664	0.000000	1.606157	0.000000	1.805668	0.000000
2.005269	0.000000	2.204983	0.000000	2.404747	0.000000	2.604576	0.000000	2.804437	0.000000
3.004336	0.000000	1.009144	00.199912	1.207631	00.199925	1.406836	00.199922	1.606179	00.199921
1.805650	00.199919	2.005278	00.199918	2.204971	00.199917	2.404750	00.199916	2.604567	00.199915
2.804437	00.199915	3.004331	00.199916	1.009144	00.399825	1.207747	00.399854	1.406859	00.399843
1.606151	00.399841	1.805663	00.399839	2.005263	00.399836	2.204978	00.399835	2.404741	00.399832
2.604570	00.399831	2.804429	00.399830	3.004331	00.399830				

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 2 - 1 OF 2

STRESS ELEMENT DATA

NEL	IRV	SR	ST	SZ	SRZ	S1	S2	S12	TS	SIGEQ	S	J2	J3
1	2	-0.4918E+04	0.6674E+04	0.8453E+02	0.E+00	0.8853E+02	-0.4918E+04	0.2503E+040.00	0.1007E+05	0.6146E+03	0.3386E+08	0.1764E+11	
2	1	-0.4874E+04	0.5764E+04	-0.1100E+03	0.1670E+03	-0.1041E+03	-0.4885E+04	0.2390E+040.03	0.9239E+04	0.2985E+03	0.2842E+08	0.1042E+11	
3	1	-0.3146E+04	0.4409E+04	-0.1098E+02	-0.5477E+02	-0.1002E+02	-0.3149E+04	0.1570E+040.02	0.6577E+04	0.4167E+03	0.1442E+08	0.5088E+10	
4	1	-0.3523E+04	0.4841E+04	0.1978E+02	0.1375E+03	0.2511E+02	-0.3529E+04	0.1777E+040.04	0.7276E+04	0.4459E+03	0.1763E+08	0.7434E+10	
5	1	-0.2387E+04	0.3803E+04	0.3528E+02	-0.5445E+02	0.3653E+02	-0.2388E+04	0.1212E+040.02	0.5403E+04	0.4836E+03	0.9729E+07	0.4271E+10	
6	1	-0.2255E+04	0.3478E+04	-0.3022E+02	0.3801E+02	-0.2957E+02	-0.2256E+04	0.1113E+040.02	0.5007E+04	0.3976E+03	0.8354E+07	0.3496E+10	
7	1	-0.1586E+04	0.2877E+04	-0.1624E+02	-0.3501E+02	-0.1546E+02	-0.1589E+04	0.7866E+030.02	0.3923E+04	0.4242E+03	0.5129E+07	0.2173E+10	
8	1	-0.1714E+04	0.3084E+04	0.1363E+02	0.3480E+02	0.1451E+02	-0.1715E+04	0.8649E+030.02	0.4210E+04	0.4810E+03	0.5905E+07	0.2552E+10	
9	1	-0.1212E+04	0.2600E+04	0.1357E+02	-0.3501E+02	0.1457E+02	-0.1213E+04	0.6139E+030.03	0.3372E+04	0.4672E+03	0.3786E+07	0.1625E+10	
10	1	-0.1133E+04	0.2446E+04	-0.1546E+02	0.1401E+02	-0.1528E+02	-0.1134E+04	0.5591E+030.01	0.3172E+04	0.4324E+03	0.3354E+07	0.1412E+10	
11	1	-0.7952E+03	0.2135E+04	-0.1168E+02	-0.2264E+02	0.1103E+02	-0.7959E+03	0.3924E+030.03	0.2628E+04	0.4428E+03	0.2302E+07	0.9522E+09	
12	1	-0.8579E+03	0.2246E+04	0.7209E+01	0.1478E+02	0.7461E+01	-0.8582E+03	0.4328E+030.02	0.2775E+04	0.4652E+03	0.2566E+07	0.1079E+10	
13	1	-0.5835E+03	0.1984E+04	0.7654E+01	-0.2264E+02	0.8520E+01	-0.5844E+03	0.2964E+030.04	0.2333E+04	0.4707E+03	0.1814E+07	0.7407E+09	
14	1	-0.5375E+03	0.1902E+04	-0.9859E+01	0.4971E+01	-0.9812E+01	-0.5375E+03	0.2639E+030.01	0.2223E+04	0.4514E+03	0.1647E+07	0.6815E+09	
15	1	-0.3374E+03	0.1723E+04	-0.8271E+01	-0.1671E+02	-0.7426E+01	-0.3387E+03	0.1656E+030.05	0.1918E+04	0.4590E+03	0.1226E+07	0.4706E+09	
16	1	-0.3763E+03	0.1784E+04	0.4463E+01	0.5240E+01	0.4535E+01	-0.3763E+03	0.1904E+030.01	0.2001E+04	0.4721E+03	0.1335E+07	0.5221E+09	
17	1	-0.2045E+03	0.1637E+04	0.6027E+01	-0.1671E+02	0.7344E+01	-0.2054E+03	0.1066E+030.08	0.1746E+04	0.4796E+03	0.1016E+07	0.3751E+09	
18	1	-0.1785E+03	0.1584E+04	-0.3470E+01	0.5910E+01	-0.3470E+01	-0.1785E+03	0.8750E+020.00	0.1682E+04	0.4673E+03	0.9427E+06	0.3395E+09	
19	1	-0.4750E+02	0.1477E+04	0.8553E+01	-0.1428E+02	0.1194E+02	-0.5093E+02	0.3146E+020.24	0.1497E+04	0.4794E+03	0.7473E+06	0.2475E+09	
20	1	-0.7561E+02	0.1514E+04	0.6422E+01	0.2405E+01	0.6493E+01	-0.7568E+02	0.4109E+020.03	0.1550E+04	0.4810E+03	0.8011E+06	0.2734E+09	
21	2	-0.4987E+04	0.6641E+04	0.5748E+02	0.5718E+02	0.5813E+02	-0.4989E+04	0.2523E+040.01	0.1010E+05	0.5704E+03	0.3400E+08	0.1730E+11	
22	1	-0.4467E+04	0.5774E+04	-0.8059E+02	-0.1379E+03	-0.7662E+02	-0.4471E+04	0.2397E+040.03	0.9234E+04	0.2753E+03	0.2840E+08	0.1006E+11	
23	1	-0.3128E+04	0.4416E+04	-0.4659E+01	0.2423E+02	-0.4470E+01	-0.3120E+04	0.1558E+040.01	0.6559E+04	0.4306E+03	0.1434E+08	0.5159E+10	
24	1	-0.3517E+04	0.4851E+04	0.4931E+02	-0.1671E+03	0.5713E+02	-0.3520E+04	0.1788E+040.05	0.7275E+04	0.4629E+03	0.1761E+08	0.7214E+10	
25	1	-0.2402E+04	0.3792E+04	0.2340E+02	0.4116E+02	0.2410E+02	-0.2403E+04	0.1213E+040.02	0.5406E+04	0.4711E+03	0.9741E+07	0.3972E+10	
26	1	-0.2755E+04	0.3476E+04	-0.3032E+02	-0.5693E+02	-0.2888E+02	-0.2757E+04	0.1114E+040.03	0.5006E+04	0.3969E+03	0.8356E+07	0.3489E+10	
27	1	-0.1574E+04	0.2879E+04	-0.1162E+02	0.2113E+02	-0.1134E+02	-0.1579E+04	0.7837E+030.01	0.3916E+04	0.4296E+03	0.5113E+07	0.2170E+10	
28	1	-0.1715E+04	0.3082E+04	0.1360E+02	-0.5542E+02	0.1540E+02	-0.1717E+04	0.8661E+030.03	0.4209E+04	0.4603E+03	0.5903E+07	0.2548E+10	
29	1	-0.1219E+04	0.2596E+04	0.1119E+02	0.2002E+02	0.1151E+02	-0.1220E+04	0.6155E+030.02	0.3373E+04	0.4625E+03	0.3791E+07	0.1619E+10	
30	1	-0.1134E+04	0.2445E+04	-0.1572E+02	-0.3052E+02	-0.1489E+02	-0.1135E+04	0.5599E+030.03	0.3171E+04	0.4318E+03	0.3352E+07	0.1410E+10	
31	1	-0.7887E+03	0.2137E+04	-0.7818E+01	0.1004E+02	-0.7889E+01	-0.7888E+03	0.3906E+030.01	0.2624E+04	0.4467E+03	0.2294E+07	0.9469E+09	
32	1	-0.8543E+03	0.2245E+04	0.6983E+01	-0.2975E+02	0.8005E+01	-0.8594E+03	0.4337E+030.03	0.2774E+04	0.4646E+03	0.2565E+07	0.1078E+10	
33	1	-0.5893E+03	0.1944E+04	0.6497E+01	0.8367E+01	0.6415E+01	-0.5894E+03	0.2979E+030.01	0.2733E+04	0.4571E+03	0.1815E+07	0.7385E+09	
34	1	-0.5377E+03	0.1901E+04	-0.9721E+01	-0.2045E+02	-0.8930E+01	-0.5385E+03	0.2648E+030.04	0.2222E+04	0.4511E+03	0.1646E+07	0.6606E+09	
35	1	-0.3160E+03	0.1721E+04	-0.4520E+01	0.3056E+01	-0.4491E+01	-0.3161E+03	0.1658E+030.01	0.1915E+04	0.4604E+03	0.1222E+07	0.4881E+09	
36	1	-0.3765E+03	0.1787E+04	0.4627E+01	-0.2018E+02	0.5693E+01	-0.3775E+03	0.1916E+030.05	0.2001E+04	0.4714E+03	0.1334E+07	0.5214E+09	
37	1	-0.2152E+03	0.1632E+04	0.4386E+01	0.2944E+01	0.4427E+01	-0.2152E+03	0.1098E+030.01	0.1748E+04	0.4737E+03	0.1016E+07	0.3745E+09	
38	1	-0.1790E+03	0.1582E+04	-0.5520E+01	-0.1542E+02	-0.4165E+01	-0.1410E+03	0.8842E+020.09	0.1684E+04	0.4656E+03	0.9424E+06	0.3394E+09	
39	1	-0.4986E+02	0.1472E+04	-0.1672E+01	0.1973E+01	-0.1794E+01	-0.4993E+02	0.2407E+020.04	0.1498E+04	0.4733E+03	0.7480E+06	0.2681E+09	
40	1	-0.7677E+02	0.1512E+04	0.4396E+01	-0.1307E+02	0.6450E+01	-0.7882E+02	0.4263E+020.16	0.1550E+04	0.4800E+03	0.8008E+06	0.2733E+09	

TABLE VI. - Continued. SAMPLE PROBLEM (3) - OUTPUT

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 2 - 1 OF 2

STRAIN ELEMENT DATA

NEL	RC	ZC	EN	ET	EZ	ERZ	LR	LZ	LT	L1	L2	TL	TS	TH	EPEQ	NEL
1	1.07545	00.06664	-0.00701	0.00804	-0.00044	0.00000	0.9931	0.9996	1.0081	0.9996	0.9931	0.00	-0.00	00.00	0.00000	1
2	1.14158	00.13328	-0.00683	0.00720	-0.00038	0.00022	0.9934	0.9996	1.0073	0.9996	0.9934	0.00	00.00	00.00	0.00000	2
3	1.34049	00.06664	-0.00449	0.00532	-0.00039	-0.00007	0.9955	0.9996	1.0054	0.9996	0.9955	3.12	-0.00	00.00	0.00000	3
4	1.27414	00.13328	-0.00501	0.00585	-0.00038	0.00018	0.9950	0.9996	1.0059	0.9996	0.9950	0.00	00.00	00.00	0.00000	4
5	1.47329	00.06664	-0.00355	0.00448	-0.00039	-0.00007	0.9965	0.9996	1.0045	0.9996	0.9965	3.12	-0.00	00.00	0.00000	5
6	1.53972	00.13328	-0.00330	0.00414	-0.00040	0.00005	0.9967	0.9996	1.0042	0.9996	0.9967	0.00	00.00	00.00	0.00000	6
7	1.73916	00.06664	-0.00245	0.00334	-0.00040	-0.00005	0.9976	0.9996	1.0034	0.9996	0.9976	3.12	-0.00	00.00	0.00000	7
8	1.67266	00.13328	-0.00265	0.00358	-0.00040	0.00005	0.9974	0.9996	1.0036	0.9996	0.9974	0.00	00.00	00.00	0.00000	8
9	1.87220	00.06664	-0.00200	0.00295	-0.00040	-0.00005	0.9980	0.9996	1.0030	0.9996	0.9980	3.11	-0.00	00.00	0.00000	9
10	1.93873	00.13328	-0.00187	0.00278	-0.00041	0.00002	0.9981	0.9996	1.0028	0.9996	0.9981	0.00	00.00	00.00	0.00000	10
11	2.13641	00.06664	-0.00143	0.00237	-0.00041	-0.00003	0.9986	0.9996	1.0024	0.9996	0.9986	3.11	-0.00	00.00	0.00000	11
12	2.07184	00.13328	-0.00154	0.00249	-0.00041	0.00002	0.9985	0.9996	1.0025	0.9996	0.9985	0.00	00.00	00.00	0.00000	12
13	2.27157	00.06664	-0.00114	0.00215	-0.00041	-0.00003	0.9988	0.9996	1.0022	0.9996	0.9988	3.10	-0.00	00.00	0.00000	13
14	2.33816	00.13328	-0.00111	0.00206	-0.00042	0.00001	0.9989	0.9996	1.0021	0.9996	0.9989	0.00	00.00	00.00	0.00000	14
15	2.53796	00.06664	-0.00085	0.00182	-0.00042	-0.00002	0.9991	0.9996	1.0018	0.9996	0.9991	3.09	-0.00	00.00	0.00000	15
16	2.47135	00.13328	-0.00092	0.00190	-0.00042	0.00001	0.9991	0.9996	1.0019	0.9996	0.9991	0.00	00.00	00.00	0.00000	16
17	2.67119	00.06664	-0.00070	0.00169	-0.00042	-0.00002	0.9993	0.9996	1.0017	0.9996	0.9993	3.06	-0.00	00.00	0.00000	17
18	2.73781	00.13328	-0.00065	0.00164	-0.00043	0.00000	0.9993	0.9996	1.0016	0.9996	0.9993	0.00	00.00	00.00	0.00000	18
19	2.93770	00.06664	-0.00049	0.00149	-0.00042	-0.00002	0.9995	0.9996	1.0015	0.9996	0.9995	2.91	-0.00	00.00	0.00000	19
20	2.87137	00.13328	-0.00053	0.00153	-0.00043	0.00000	0.9995	0.9996	1.0015	0.9996	0.9995	0.00	00.00	00.00	0.00000	20
21	1.07534	00.33320	-0.00706	0.00804	-0.00044	0.00007	0.9930	0.9996	1.0081	0.9996	0.9930	0.00	00.00	00.00	0.00000	21
22	1.14157	00.26656	-0.00663	0.00719	-0.00035	-0.00018	0.9934	0.9996	1.0073	0.9997	0.9934	3.11	-0.00	00.00	0.00000	22
23	1.34048	00.33321	-0.00447	0.00532	-0.00039	0.00003	0.9956	0.9996	1.0054	0.9996	0.9956	0.00	00.00	00.00	0.00000	23
24	1.27414	00.26657	-0.00501	0.00585	-0.00035	-0.00022	0.9950	0.9996	1.0059	0.9997	0.9950	3.09	-0.00	00.00	0.00000	24
25	1.47328	00.33320	-0.00356	0.00448	-0.00039	0.00005	0.9965	0.9996	1.0045	0.9996	0.9965	0.00	00.00	00.00	0.00000	25
26	1.53972	00.26656	-0.00330	0.00414	-0.00040	-0.00007	0.9967	0.9996	1.0042	0.9996	0.9967	3.12	-0.00	00.00	0.00000	26
27	1.73915	00.33320	-0.00245	0.00334	-0.00040	0.00003	0.9976	0.9996	1.0034	0.9996	0.9976	0.00	00.00	00.00	0.00000	27
28	1.67266	00.26656	-0.00265	0.00358	-0.00040	-0.00007	0.9974	0.9996	1.0036	0.9996	0.9974	3.11	-0.00	00.00	0.00000	28
29	1.87219	00.33320	-0.00201	0.00295	-0.00040	0.00003	0.9980	0.9996	1.0030	0.9996	0.9980	0.00	00.00	00.00	0.00000	29
30	1.93873	00.26656	-0.00187	0.00278	-0.00041	-0.00004	0.9981	0.9996	1.0028	0.9996	0.9981	3.11	-0.00	00.00	0.00000	30
31	2.13840	00.33320	-0.00143	0.00237	-0.00041	0.00001	0.9986	0.9996	1.0024	0.9996	0.9986	0.00	00.00	00.00	0.00000	31
32	2.07184	00.26656	-0.00154	0.00249	-0.00041	-0.00004	0.9985	0.9996	1.0025	0.9996	0.9985	3.11	-0.00	00.00	0.00000	32
33	2.27156	00.33319	-0.00119	0.00215	-0.00041	0.00001	0.9988	0.9996	1.0022	0.9996	0.9988	0.00	00.00	00.00	0.00000	33
34	2.33815	00.26656	-0.00111	0.00206	-0.00042	-0.00003	0.9989	0.9996	1.0021	0.9996	0.9989	3.10	-0.00	00.00	0.00000	34
35	2.53796	00.33319	-0.00085	0.00182	-0.00042	0.00000	0.9991	0.9996	1.0018	0.9996	0.9991	0.00	00.00	00.00	0.00000	35
36	2.47135	00.26655	-0.00092	0.00189	-0.00042	-0.00003	0.9991	0.9996	1.0019	0.9996	0.9991	3.09	-0.00	00.00	0.00000	36
37	2.67119	00.33319	-0.00071	0.00169	-0.00042	0.00000	0.9993	0.9996	1.0017	0.9996	0.9993	0.00	00.00	00.00	0.00000	37
38	2.73781	00.26655	-0.00065	0.00163	-0.00043	-0.00002	0.9993	0.9996	1.0016	0.9996	0.9993	3.05	-0.00	00.00	0.00000	38
39	2.93770	00.33319	-0.00049	0.00148	-0.00043	0.00000	0.9995	0.9996	1.0015	0.9996	0.9995	0.00	00.00	00.00	0.00000	39
40	2.87107	00.26655	-0.00053	0.00153	-0.00043	-0.00002	0.9995	0.9996	1.0015	0.9996	0.9995	2.99	-0.00	00.00	0.00000	40

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.	ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
1	00.44170E+02	0.E+00	00.44170E+02	00.61464E+03	2	00.37026E+02	0.E+00	00.37026E+02	00.25847E+03
3	00.18850E+02	0.E+00	00.18850E+02	00.41674E+03	4	00.23061E+02	0.E+00	00.23061E+02	00.44588E+03
5	00.12791E+02	0.E+00	00.12791E+02	00.48357E+03	6	00.10957E+02	0.E+00	00.10957E+02	00.39763E+03
7	00.67769E+01	0.E+00	00.67769E+01	00.42418E+03	8	00.78072E+01	0.E+00	00.78072E+01	00.46097E+03
9	00.50574E+01	0.E+00	00.50574E+01	00.46725E+03	10	00.44721E+01	0.E+00	00.44721E+01	00.43242E+03
11	00.31105E+01	0.E+00	00.31105E+01	00.44277E+03	12	00.34662E+01	0.E+00	00.34662E+01	00.46517E+03
13	00.24917E+01	0.E+00	00.24917E+01	00.47071E+03	14	00.22632E+01	0.E+00	00.22632E+01	00.45143E+03
15	00.17199E+01	0.E+00	00.17199E+01	00.45896E+03	16	00.18695E+01	0.E+00	00.18695E+01	00.47211E+03
17	00.14595E+01	0.E+00	00.14595E+01	00.47961E+03	18	00.13566E+01	0.E+00	00.13566E+01	00.46733E+03
19	00.11096E+01	0.E+00	00.11096E+01	00.47936E+03	20	00.11806E+01	0.E+00	00.11806E+01	00.48162E+03
21	00.44399E+02	0.E+00	00.44399E+02	00.57041E+03	22	00.36995E+02	0.E+00	00.36995E+02	00.27530E+03
23	00.18754E+02	0.E+00	00.18754E+02	00.43061E+03	24	00.23061E+02	0.E+00	00.23061E+02	00.46293E+03
25	00.12799E+02	0.E+00	00.12799E+02	00.47115E+03	26	00.10954E+02	0.E+00	00.10954E+02	00.39689E+03
27	00.67576E+01	0.E+00	00.67576E+01	00.42956E+03	28	00.78052E+01	0.E+00	00.78052E+01	00.46033E+03
29	00.50571E+01	0.E+00	00.50571E+01	00.46251E+03	30	00.44705E+01	0.E+00	00.44705E+01	00.43177E+03
31	00.31024E+01	0.E+00	00.31024E+01	00.44670E+03	32	00.34648E+01	0.E+00	00.34648E+01	00.46456E+03
33	00.24904E+01	0.E+00	00.24904E+01	00.46708E+03	34	00.22621E+01	0.E+00	00.22621E+01	00.45111E+03
35	00.17167E+01	0.E+00	00.17167E+01	00.46048E+03	36	00.18686E+01	0.E+00	00.18686E+01	00.47184E+03
37	00.14583E+01	0.E+00	00.14583E+01	00.47372E+03	38	00.13555E+01	0.E+00	00.13555E+01	00.46563E+03
39	00.11068E+01	0.E+00	00.11068E+01	00.47327E+03	40	00.11795E+01	0.E+00	00.11795E+01	00.47995E+03

THE ELASTIC ENERGY IS 00.678333E+02
THE PLASTIC ENERGY IS 0.E+00
THE TOTAL ENERGY IS 00.678333E+02FOR A LOAD OF 00.153324E+05
THIS IS INCHEMENT 2 - 1 OF 2
THE APPLIED LOAD IS 15332.4346THE INC. LOAD IS 7186.9549

SCALED STEP

TABLE VI. - Continued. SAMPLE PROBLEM (3) - OUTPUT

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STATE MAP  STEP    2 -     2

     3    2    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1
     3    2    1    1    1    1    1    1    1    1
     1    1    1    1    1    1    1    1    1    1

                                                TOTAL      DISPLACEMENTS
0.00993130  0.00000000   0.00837534  0.00000000   0.00741320  0.00000000   0.00664729  0.00000000   0.00611606  0.00000000
0.00568308  0.00000000   0.00537188  0.00000000   0.00511505  0.00000000   0.00493007  0.00000000   0.00477895  0.00000000
0.00467217  0.00000000   0.00993130  -.00008376   0.00848048  -.00007344   0.00738938  -.00008116   0.00667208  -.00008309
0.00609711  -.00008534   0.00569212  -.00008694   0.00535853  -.00008822   0.00511845  -.00008957   0.00491989  -.00009083
0.00477840  -.00009111   0.00466325  -.00008980   0.00993130  -.00016604   0.00838542  -.00014135   0.00714934  -.00016427
0.00664046  -.00016582   0.00611110  -.00017023   0.00567574  -.00017378   0.00536556  -.00017596   0.00510748  -.00017900
0.00492258  -.00018080   0.00476915  -.00018253   0.00466296  -.00018167

                                                INCREMENTAL  DISPLACEMENTS
0.00078739  0.00000000   0.00061843  0.00000000   0.00054885  0.00000000   0.00049001  0.00000000   0.00044829  0.00000000
0.00041379  0.00000000   0.00038893  0.00000000   0.00036847  0.00000000   0.00035391  0.00000000   0.00034226  0.00000000
0.00033411  0.00000000   0.00038739  0.00000385   0.00064948  0.00000166   0.00055350  -.00000330   0.00049410  -.00000366
0.00044692  -.00000477   0.00041427  -.00000510   0.00038735  -.00000549   0.00036820  -.00000576   0.00035241  -.00000607
0.00034143  -.00000610   0.00033261  -.00000575   0.00037739  0.00000929   0.00061836  0.00000425   0.00054993  -.00000769
0.00048472  -.00000704   0.00044778  -.00000933   0.00041246  -.00001013   0.00038765  -.00001080   0.00036678  -.00001147
0.00035217  -.00001192   0.00033994  -.00001228   0.00033189  -.00001195

                                                INCREMENTAL  FORCES
   154.0        16.2         -0.0        16.9         -0.0       -34.1          0.0        12.0         -0.0        -3.3
    -0.0         2.7          0.0         1.3         -0.0         2.0         -0.0         0.0         -0.0        -2.3
     0.0       -12.4        880.0         0.0         -0.0         -0.0         -0.0         0.0          0.0         -0.0
    -0.0         0.0         -0.0         -0.0         -0.0         0.0         -0.0         -0.0         0.0         0.0
     0.0         -0.0         0.0         0.0        141.0         -0.0         -0.0         -0.0         0.0         -0.0
    -0.0         -0.0         0.0         -0.0         0.0         -0.0         0.0         -0.0         0.0         0.0
     0.0         -0.0         0.0         0.0          0.0         0.0

                                                TOTAL      FORCES
  3756.0       -43.2         -0.0       125.6         -0.0       -52.9          0.0        14.3         -0.0         1.4
    -0.0         1.4          -0.0         8.0         -0.0         3.9         -0.0         5.4         -0.0        -9.6
     0.0       -54.5        8925.0         -0.0         -0.0         -0.0         -0.0         0.0          0.0         -0.0
     0.0         0.0          -0.0         -0.0         0.0          0.0         -0.0         -0.0         0.0         0.0
    -0.0         -0.0         0.0         0.0        3826.4         -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         0.0         0.0
     0.0         -0.0         0.0         0.0          0.0         0.0

                                                NODAL      COORDINATES
  1.009931    0.000000     1.208375    0.000000     1.407413    0.000000     1.606647    0.000000     1.806117    0.000000
  2.005683    0.000000     2.205372    0.000000     2.405115    0.000000     2.604930    0.000000     2.804779    0.000000
  3.004672    0.000000     1.009931    00.199916    1.208480    00.199927    1.407389    00.199919    1.606673    00.199917
  1.806097    00.199915    2.005692    00.199913    2.205359    00.199912    2.405118    00.199910    2.604920    00.199909
  2.804778    00.199909    3.004663    00.199910    1.009931    00.399834    1.208365    00.399859    1.407409    00.399836
  1.606640    00.399834    1.806111    00.399830    2.005676    00.399826    2.205366    00.399824    2.405107    00.399821
  2.604923    00.399819    2.804769    00.399817    3.004663    00.399818
SAMPLE PROBLEM  3  EXPANSION OF A THICK WALL TUBE                                                    STEP    2 -    2 OF    2

                                        STRESS ELEMENT DATA

NEL IRV     SR          ST          SZ          SRZ         S1          S2          S12         TS          SIGEQ       S           J2          J3

  1 3-0.5149E+04 0.6550E+04 0.6446E+02 0.E+00      0.6446E+02-0.5149E+04 0.2607E+040.00 0.1015E+05 0.4883E+03 0.3435E+08 0.1449E+11
  2 2-0.5462E+04 0.6177E+04-0.1430E+03 0.2230E+03-0.1437E+03-0.5472E+04 0.2664E+040.04 0.1010E+05 0.4871E+03 0.3395E+08 0.1451E+11
  3 1-0.3381E+04 0.4774E+04 0.1204E+02-0.4591E+02 0.1267E+02-0.3382E+04 0.1697E+040.01 0.7097E+04 0.4684E+03 0.1678E+08 0.7364E+10
  4 1-0.3493E+04 0.3209E+04 0.2764E+02 0.1881E+03 0.3864E+02-0.3902E+04 0.1969E+040.05 0.7915E+04 0.4480E+03 0.2065E+08 0.9689E+10
  5 1-0.2586E+04 0.4104E+04 0.5055E+02-0.4589E+02 0.5135E+02-0.2587E+04 0.1319E+040.02 0.5841E+04 0.5240E+03 0.1137E+08 0.5277E+10
  6 1-0.2475E+04 0.3744E+04-0.3478E+02 0.4522E+02-0.3394E+02-0.2475E+04 0.1221E+040.02 0.5427E+04 0.4114E+03 0.9819E+07 0.4291E+10
  7 1-0.1736E+04 0.3100E+04-0.1586E+02-0.3765E+02-0.1503E+02-0.1731E+04 0.8579E+030.02 0.4241E+04 0.4513E+03 0.5995E+07 0.2599E+10
  8 1-0.1677E+04 0.3321E+04 0.1705E+02 0.4456E+02 0.1609E+02-0.1680E+04 0.9490E+030.02 0.4558E+04 0.4803E+03 0.6924E+07 0.3146E+10
  9 1-0.1324E+04 0.2801E+04 0.1619E+02-0.3764E+02 0.1724E+02-0.1325E+04 0.6712E+030.03 0.3645E+04 0.4978E+03 0.4427E+07 0.2020E+10
 10 1-0.1242E+04 0.2632E+04-0.1767E+02 0.1431E+02-0.1750E+02-0.1242E+04 0.6122E+030.01 0.3430E+04 0.4575E+03 0.3921E+07 0.1756E+10
 11 1-0.8716E+03 0.2297E+04-0.1342E+02-0.2569E+02-0.1265E+02-0.8723E+03 0.4298E+030.03 0.2839E+04 0.4708E+03 0.2669E+07 0.1187E+10
 12 1-0.9413E+03 0.2417E+04 0.7450E+01 0.1494E+02 0.8185E+01-0.9415E+03 0.4748E+030.02 0.2999E+04 0.4946E+03 0.2997E+07 0.1343E+10
 13 1-0.6403E+03 0.2139E+04 0.4530E+01-0.2569E+02 0.9545E+01-0.6413E+03 0.3254E+030.04 0.2519E+04 0.5025E+03 0.2114E+07 0.9239E+09
 14 1-0.5906E+03 0.2045E+04-0.1147E+02 0.3931E+01-0.1144E+02-0.5907E+03 0.2896E+030.01 0.2399E+04 0.4811E+03 0.1919E+07 0.8588E+09
 15 1-0.3722E+03 0.1853E+04-0.9762E+01-0.1960E+02-0.8705E+01-0.3731E+03 0.1822E+030.05 0.2069E+04 0.4906E+03 0.1426E+07 0.6382E+09
 16 1-0.4143E+03 0.1924E+04 0.4447E+01 0.4115E+01 0.4887E+01-0.4146E+03 0.2097E+030.01 0.2159E+04 0.5047E+03 0.1554E+07 0.6519E+09
 17 1-0.2656E+03 0.1762E+04 0.7008E+01-0.1959E+02 0.8651E+01-0.2266E+03 0.1176E+030.08 0.1882E+04 0.5148E+03 0.1161E+07 0.4886E+09
 18 1-0.1973E+03 0.1704E+04-0.3480E+01-0.1604E+01-0.3467E+01-0.1973E+03 0.9691E+020.01 0.1813E+04 0.5012E+03 0.1095E+07 0.4242E+09
 19 1-0.5295E+02 0.1591E+04 0.1237E+02-0.1716E+02 0.1660E+02-0.5718E+02 0.3689E+020.24 0.1613E+04 0.5168E+03 0.8663E+06 0.3087E+09
 20 1-0.8456E+02 0.1630E+04 0.7966E+01 0.1479E+01 0.7989E+01-0.8454E+02 0.4627E+020.02 0.1670E+04 0.5178E+03 0.9297E+06 0.3414E+09
 21 3-0.5218E+04 0.6522E+04 0.4252E+02 0.4221E+02 0.4265E+02-0.5214E+04 0.2628E+040.01 0.1018E+05 0.4504E+03 0.3455E+08 0.1403E+11
 22 2-0.5444E+04 0.6189E+04-0.1174E+03-0.2025E+03-0.1097E+03-0.5456E+04 0.2673E+040.04 0.1010E+05 0.2077E+03 0.3393E+08 0.1100E+11
 23 1-0.3344E+04 0.4782E+04 0.1454E+02-0.5617E+01 0.1455E+02-0.3346E+04 0.1681E+040.00 0.7075E+04 0.4827E+03 0.1669E+08 0.7710E+10
 24 1-0.3879E+04 0.5222E+04 0.6333E+02-0.2369E+03 0.7752E+02-0.3893E+04 0.1945E+040.06 0.7915E+04 0.4684E+03 0.2083E+08 0.9380E+10
 25 1-0.2613E+04 0.4090E+04 0.2744E+02 0.3545E+02 0.2796E+02-0.2614E+04 0.1321E+040.01 0.5849E+04 0.5014E+03 0.1146E+08 0.5298E+10
 26 1-0.2474E+04 0.3743E+04-0.3329E+02-0.6579E+02-0.3152E+02-0.2476E+04 0.1222E+040.03 0.5426E+04 0.4116E+03 0.9811E+07 0.4277E+10
 27 1-0.1721E+04 0.3101E+04-0.1050E+02 0.1867E+02-0.1030E+02-0.1722E+04 0.8557E+030.01 0.4235E+04 0.4565E+03 0.5979E+07 0.2690E+10
 28 1-0.1479E+04 0.3320E+04 0.1460E+02-0.6641E+02 0.2042E+02-0.1481E+04 0.9510E+030.03 0.4554E+04 0.4866E+03 0.6926E+07 0.3136E+10
 29 1-0.1336E+04 0.2794E+04 0.1272E+02 0.2012E+02 0.1302E+02-0.1337E+04 0.6748E+030.01 0.3684E+04 0.4900E+03 0.4435E+07 0.2008E+10
 30 1-0.1264E+04 0.2631E+04-0.1768E+02-0.3442E+02-0.1670E+02-0.1243E+04 0.6132E+030.03 0.3429E+04 0.4569E+03 0.3915E+07 0.1753E+10
 31 1-0.8645E+03 0.2299E+04-0.8484E+01 0.9341E+01-0.8382E+01-0.8646E+03 0.4281E+030.01 0.2834E+04 0.4753E+03 0.2677E+07 0.1182E+10
 32 1-0.9416E+03 0.2416E+04 0.7491E+01-0.3348E+02 0.9205E+01-0.9428E+03 0.4760E+030.04 0.2998E+04 0.4940E+03 0.2995E+07 0.1341E+10
 33 1-0.6488E+03 0.2134E+04 0.6891E+01 0.7698E+01 0.6981E+01-0.6487E+03 0.3278E+030.01 0.2520E+04 0.4975E+03 0.2116E+07 0.9202E+09
 34 1-0.5904E+03 0.2044E+04-0.1113E+02-0.2371E+02-0.1016E+02-0.5918E+03 0.2904E+030.04 0.2399E+04 0.4804E+03 0.1918E+07 0.8423E+09
 35 1-0.3701E+03 0.1854E+04-0.4895E+01 0.1719E+01-0.4887E+01-0.3701E+03 0.1826E+030.00 0.2065E+04 0.4928E+03 0.1422E+07 0.6344E+09
 36 1-0.4147E+03 0.1923E+04 0.5220E+01-0.2353E+02 0.6534E+01-0.4160E+03 0.2113E+030.06 0.2159E+04 0.5044E+03 0.1553E+07 0.6507E+09
 37 1-0.2391E+03 0.1755E+04 0.4475E+01 0.1855E+01 0.4889E+01-0.2393E+03 0.1221E+030.01 0.1884E+04 0.5069E+03 0.1164E+07 0.4677E+09
 38 1-0.1988E+03 0.1702E+04-0.6180E+01-0.1835E+02-0.4448E+01-0.2005E+03 0.9805E+020.09 0.1812E+04 0.4990E+03 0.1095E+07 0.4241E+09
 39 1-0.5622E+02 0.1584E+04-0.1110E+01 0.1110E+01-0.1081E+01-0.5624E+02 0.2754E+020.02 0.1613E+04 0.5068E+03 0.8675E+06 0.3098E+09
 40 1-0.4604E+02 0.1627E+04 0.5249E+01-0.1526E+02 0.7781E+01-0.8852E+02 0.4815E+020.16 0.1670E+04 0.5156E+03 0.9293E+06 0.3413E+09
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TABLE VI. - Continued. SAMPLE PROBLEM (3) - OUTPUT

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 2 - 2 OF 2

STRAIN ELEMENT DATA

NEL	RC	ZC	ER	ET	EZ	ERZ	LR	LZ	LT	L1	L2	TL	TS	TH	EPEQ	NEL
1	1.07608	00.06664	-0.00787	0.00871	-0.00042	0.00000	0.9922	0.9996	1.0088	0.9996	0.9922	0.00	-0.00	00.00	0.00082	1
2	1.14226	00.13328	-0.00733	0.00779	-0.00037	0.00029	0.9927	0.9996	1.0079	0.9996	0.9927	0.00	00.00	00.00	0.00000	2
3	1.34166	00.06664	-0.00485	0.00574	-0.00041	-0.00006	0.9952	0.9996	1.0058	0.9996	0.9952	3.13	-0.00	00.00	0.00000	3
4	1.27475	00.13328	-0.00550	0.00632	-0.00037	0.00025	0.9945	0.9996	1.0064	0.9996	0.9945	0.00	00.00	00.00	0.00000	4
5	1.47342	00.06664	-0.00385	0.00484	-0.00041	-0.00006	0.9962	0.9996	1.0049	0.9996	0.9962	3.12	-0.00	00.00	0.00000	5
6	1.54024	00.13328	-0.00380	0.00447	-0.00042	0.00006	0.9964	0.9996	1.0045	0.9996	0.9964	0.00	00.00	00.00	0.00000	6
7	1.73962	00.06664	-0.00266	0.00361	-0.00043	-0.00005	0.9973	0.9996	1.0036	0.9996	0.9973	3.12	-0.00	00.00	0.00000	7
8	1.67314	00.13328	-0.00289	0.00386	-0.00042	0.00006	0.9971	0.9996	1.0039	0.9996	0.9971	0.00	00.00	00.00	0.00000	8
9	1.87263	00.06664	-0.00217	0.00318	-0.00043	-0.00005	0.9978	0.9996	1.0032	0.9996	0.9978	3.11	-0.00	00.00	0.00000	9
10	1.93916	00.13328	-0.00203	0.00300	-0.00043	0.00002	0.9980	0.9996	1.0030	0.9996	0.9980	0.00	00.00	00.00	0.00000	10
11	2.13880	00.06664	-0.00156	0.00255	-0.00044	-0.00003	0.9984	0.9996	1.0026	0.9996	0.9984	3.11	-0.00	00.00	0.00000	11
12	2.07224	00.13327	-0.00167	0.00269	-0.00043	0.00002	0.9983	0.9996	1.0027	0.9996	0.9983	0.00	00.00	00.00	0.00000	12
13	2.27195	00.06664	-0.00129	0.00232	-0.00044	-0.00003	0.9987	0.9996	1.0023	0.9996	0.9987	3.10	-0.00	00.00	0.00000	13
14	2.33853	00.13327	-0.00120	0.00222	-0.00045	0.00001	0.9988	0.9996	1.0022	0.9996	0.9988	0.00	00.00	00.00	0.00000	14
15	2.53832	00.06664	-0.00093	0.00196	-0.00045	-0.00003	0.9991	0.9995	1.0020	0.9995	0.9991	3.09	-0.00	00.00	0.00000	15
16	2.47172	00.13327	-0.00094	0.00204	-0.00045	0.00001	0.9990	0.9996	1.0020	0.9996	0.9990	0.00	00.00	00.00	0.00000	16
17	2.67154	00.06664	-0.00076	0.00182	-0.00045	-0.00003	0.9992	0.9995	1.0018	0.9995	0.9992	3.08	-0.00	00.00	0.00000	17
18	2.73816	00.13327	-0.00071	0.00176	-0.00046	-0.00000	0.9993	0.9995	1.0018	0.9995	0.9993	3.13	-0.00	00.00	0.00000	18
19	2.93804	00.06664	-0.00053	0.00160	-0.00045	-0.00002	0.9995	0.9996	1.0016	0.9996	0.9995	2.90	-0.00	00.00	0.00000	19
20	2.87141	00.13327	-0.00056	0.00165	-0.00046	0.00000	0.9994	0.9995	1.0017	0.9995	0.9994	0.00	00.00	00.00	0.00000	20
21	1.07608	00.33320	-0.00742	0.00871	-0.00041	0.00006	0.9922	0.9996	1.0088	0.9996	0.9922	0.00	00.00	00.00	0.00082	21
22	1.14226	00.26657	-0.00733	0.00778	-0.00034	-0.00027	0.9927	0.9997	1.0079	0.9997	0.9927	3.10	-0.00	00.00	0.00000	22
23	1.34165	00.33320	-0.00481	0.00574	-0.00042	-0.00001	0.9952	0.9996	1.0058	0.9996	0.9952	3.14	-0.00	00.00	0.00000	23
24	1.27475	00.26657	-0.00550	0.00632	-0.00034	-0.00031	0.9945	0.9997	1.0064	0.9997	0.9945	3.08	-0.00	00.00	0.00000	24
25	1.47341	00.33320	-0.00387	0.00484	-0.00042	0.00005	0.9962	0.9996	1.0049	0.9996	0.9962	0.00	00.00	00.00	0.00000	25
26	1.54023	00.26656	-0.00380	0.00447	-0.00041	-0.00009	0.9964	0.9996	1.0045	0.9996	0.9964	3.11	-0.00	00.00	0.00000	26
27	1.73962	00.33319	-0.00266	0.00361	-0.00042	0.00002	0.9974	0.9996	1.0036	0.9996	0.9974	0.00	00.00	00.00	0.00000	27
28	1.67314	00.26656	-0.00289	0.00386	-0.00041	-0.00009	0.9971	0.9996	1.0039	0.9996	0.9971	3.11	-0.00	00.00	0.00000	28
29	1.87263	00.33319	-0.00218	0.00318	-0.00042	0.00003	0.9978	0.9996	1.0032	0.9996	0.9978	0.00	00.00	00.00	0.00000	29
30	1.93915	00.26655	-0.00203	0.00300	-0.00043	-0.00005	0.9980	0.9996	1.0030	0.9996	0.9980	3.11	-0.00	00.00	0.00000	30
31	2.13880	00.33319	-0.00155	0.00255	-0.00044	0.00001	0.9984	0.9996	1.0026	0.9996	0.9984	0.00	00.00	00.00	0.00000	31
32	2.07224	00.26655	-0.00167	0.00269	-0.00043	-0.00004	0.9983	0.9996	1.0027	0.9996	0.9983	3.11	-0.00	00.00	0.00000	32
33	2.27194	00.33319	-0.00124	0.00232	-0.00044	0.00001	0.9987	0.9996	1.0023	0.9996	0.9987	0.00	00.00	00.00	0.00000	33
34	2.33853	00.26655	-0.00120	0.00222	-0.00045	-0.00003	0.9988	0.9996	1.0022	0.9996	0.9988	3.10	-0.00	00.00	0.00000	34
35	2.53832	00.33318	-0.00093	0.00196	-0.00045	0.00000	0.9991	0.9996	1.0020	0.9996	0.9991	0.00	00.00	00.00	0.00000	35
36	2.47172	00.26655	-0.00099	0.00204	-0.00045	-0.00003	0.9990	0.9996	1.0020	0.9996	0.9990	3.09	-0.00	00.00	0.00000	36
37	2.67154	00.33318	-0.00077	0.00182	-0.00045	0.00000	0.9992	0.9996	1.0018	0.9996	0.9992	0.00	00.00	00.00	0.00000	37
38	2.73816	00.26655	-0.00071	0.00176	-0.00046	-0.00002	0.9993	0.9995	1.0018	0.9995	0.9993	3.05	-0.00	00.00	0.00000	38
39	2.93803	00.33318	-0.00053	0.00160	-0.00046	0.00000	0.9995	0.9995	1.0016	0.9995	0.9995	0.00	00.00	00.00	0.00000	39
40	2.87140	00.26655	-0.00058	0.00165	-0.00046	-0.00002	0.9994	0.9995	1.0017	0.9995	0.9994	2.98	-0.00	00.00	0.00000	40

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.	ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
1	00.44803E+02	00.82417E+01	00.53045E+02	00.48832E+03	2	00.44225E+02	0.E+00	00.44225E+02	00.18710E+03
3	00.21955E+02	0.E+00	00.21955E+02	00.46835E+03	4	00.27266E+02	0.E+00	00.27266E+02	00.-4801E+03
5	00.14949E+02	0.E+00	00.14949E+02	00.52397E+03	6	00.12865E+02	0.E+00	00.12865E+02	00.-1141E+03
7	00.79178E+01	0.E+00	00.79178E+01	00.45126E+03	8	00.91456E+01	0.E+00	00.91456E+01	00.-8626E+03
9	00.59058E+01	0.E+00	00.59058E+01	00.49755E+03	10	00.52233E+01	0.E+00	00.52233E+01	00.-5755E+03
11	00.36259E+01	0.E+00	00.36259E+01	00.47077E+03	12	00.40431E+01	0.E+00	00.40431E+01	00.-9456E+03
13	00.29010E+01	0.E+00	00.29010E+01	00.50247E+03	14	00.26338E+01	0.E+00	00.26338E+01	00.-8110E+03
15	00.19986E+01	0.E+00	00.19986E+01	00.49055E+03	16	00.21733E+01	0.E+00	00.21733E+01	00.50457E+03
17	00.16944E+01	0.E+00	00.16944E+01	00.51478E+03	18	00.15744E+01	0.E+00	00.15744E+01	00.50123E+03
19	00.12871E+01	0.E+00	00.12871E+01	00.51681E+03	20	00.13694E+01	0.E+00	00.13694E+01	00.51776E+03
21	00.45045E+02	00.82751E+01	00.53320E+02	00.45037E+03	22	00.44192E+02	0.E+00	00.44192E+02	00.20775E+03
23	00.21833E+02	0.E+00	00.21833E+02	00.46274E+03	24	00.27280E+02	0.E+00	00.27280E+02	00.-6837E+03
25	00.14976E+02	0.E+00	00.14976E+02	00.50144E+03	26	00.12862E+02	0.E+00	00.12862E+02	00.41162E+03
27	00.78979E+01	0.E+00	00.78979E+01	00.45651E+03	28	00.91443E+01	0.E+00	00.91443E+01	00.-8657E+03
29	00.59100E+01	0.E+00	00.59100E+01	00.49004E+03	30	00.52213E+01	0.E+00	00.52213E+01	00.-5694E+03
31	00.36158E+01	0.E+00	00.36158E+01	00.47527E+03	32	00.40415E+01	0.E+00	00.40415E+01	00.-9492E+03
33	00.28999E+01	0.E+00	00.28999E+01	00.49748E+03	34	00.26323E+01	0.E+00	00.26323E+01	00.-8060E+03
35	00.19943E+01	0.E+00	00.19943E+01	00.49283E+03	36	00.21720E+01	0.E+00	00.21720E+01	00.50441E+03
37	00.16928E+01	0.E+00	00.16928E+01	00.50694E+03	38	00.15729E+01	0.E+00	00.15729E+01	00.49899E+03
39	00.12831E+01	0.E+00	00.12831E+01	00.50884E+03	40	00.13679E+01	0.E+00	00.13679E+01	00.51957E+03

THE ELASTIC ENERGY IS 00.777558E+02
THE PLASTIC ENERGY IS 00.221512E+01
THE TOTAL ENERGY IS 00.799709E+02FOR A LOAD OF 00.165074E+05
THIS IS INCREMENT 2 - 2 OF 2
THE APPLIED LOAD IS 16507.4264THE INC. LOAD IS 1174.9918

SCALED STEP

TABLE VI. - Continued. SAMPLE PROBLEM (3) - OUTPUT

STATE MAP STEP 2 - 3

```
   3   3   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1   1
   3   3   1   1   1   1   1   1   1   1
   1   1   1   1   1   1   1   1   1   1
```

TOTAL DISPLACEMENTS

0.01000000	0.00000000	0.00842699	0.00000000	0.00745846	0.00000000	0.00666744	0.00000000	0.00615337	0.00000000
0.00571697	0.00000000	0.00540372	0.00000000	0.00514520	0.00000000	0.00495902	0.00000000	0.00480694	0.00000000
0.00469949	0.00000000	0.01000000	-.00008244	0.00853320	-.00007260	0.00743441	-.00006117	0.00671305	-.00005339
0.00613369	-.00008576	0.00572603	-.00008737	0.00539023	-.00008867	0.00514857	-.00009004	0.00494871	-.00009132
0.00480632	-.00009161	0.00469044	-.00009026	0.01000000	-.00018338	0.00841748	-.00013955	0.00745512	-.00016437
0.00668084	-.00016649	0.00614787	-.00017099	0.00570953	-.00017463	0.00539729	-.00017684	0.00513748	-.00017993
0.00495138	-.00018176	0.00479694	-.00018352	0.00469009	-.00018263				

INCREMENTAL DISPLACEMENTS

0.00006870	0.00000000	0.00005165	0.00000000	0.00004526	0.00000000	0.00004014	0.00000000	0.00003672	0.00000000
0.00003389	0.00000000	0.00003194	0.00000000	0.00003015	0.00000000	0.00002895	0.00000000	0.00002799	0.00000000
0.00002732	0.00000000	0.00006870	0.00000132	0.00005271	0.00000084	0.00004503	-.00000001	0.00004038	-.00000031
0.00003658	-.00000042	0.00003391	-.00000043	0.00003170	-.00000045	0.00003012	-.00000047	0.00002862	-.00000049
0.00002742	-.00000050	0.00002719	-.00000046	0.00006870	0.00000266	0.00005207	0.00000180	0.00004578	-.00000010
0.00004038	-.00000067	0.00003677	-.00000076	0.00003379	-.00000085	0.00003173	-.00000088	0.00003000	-.00000093
0.00002880	-.00000097	0.00002779	-.00000100	0.00002712	-.00000097				

INCREMENTAL FORCES

19.4	2.2	-0.0	2.0	-0.0	-3.5	-0.0	-0.7	-0.0	00.3
-0.0	00.4	-0.0	00.3	0.0	00.2	-0.0	00.1	-0.0	-0.2
00.0	-1.1	45.0	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	16.5	-0.0	-0.0	-0.0	00.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

TOTAL FORCES

3775.5	-41.0	-0.0	127.6	-0.0	-56.3	00.0	13.6	-0.0	1.7
-0.0	1.8	-0.0	8.2	-0.0	4.1	-0.0	5.5	-0.0	-9.8
00.0	-55.6	8969.9	-0.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	-0.0	00.0
-0.0	-0.0	00.0	00.0	3843.0	-0.0	-0.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	-0.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

NODAL COORDINATES

1.010000	0.000000	1.208427	0.000000	1.407458	0.000000	1.606687	0.000000	1.806153	0.000000
2.005717	0.000000	2.205404	0.000000	2.405145	0.000000	2.604959	0.000000	2.804807	0.000000
3.004699	0.000000	1.010000	00.199918	1.208533	00.199927	1.407434	00.199919	1.606713	00.199917
1.806134	00.199914	2.005726	00.199913	2.205390	00.199911	2.405149	00.199910	2.604949	00.199909
2.804806	00.199908	3.004690	00.199910	1.010000	00.399837	1.208417	00.399860	1.407455	00.399836
1.606681	00.399834	1.806148	00.399829	2.005710	00.399825	2.205397	00.399823	2.405137	00.399820
2.604951	00.399818	2.804797	00.399816	3.004690	00.399817				

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 2 - 3 OF 2

STRESS ELEMENT DATA

NEL	INV	SR	ST	SZ	SRZ	S1	S2	S12	TS	SIGEQ	S	J2	J3
1	3	-0.5179E+04	0.6531E+04	0.6120E+02	0.E+00	0.6120E+02	-0.5179E+04	0.2620E+040.00		0.1016E+05	0.4710E+03	0.3441E+08	0.1403E+11
2	3	-0.5495E+04	0.6153E+04	-0.1620E+03	0.2224E+03	-0.1527E+03	-0.5504E+04	0.2676E+040.04		0.1011E+05	0.1656E+03	0.3400E+08	0.1110E+11
3	1	-0.3404E+04	0.4803E+04	0.1383E+02	-0.4636E+02	0.1446E+02	-0.3405E+04	0.1710E+040.01		0.7141E+04	0.4710E+03	0.1703E+08	0.7075E+10
4	1	-0.3425E+04	0.5242E+04	0.3356E+02	0.1865E+03	0.4254E+02	-0.3929E+04	0.1986E+040.05		0.7966E+04	0.4519E+03	0.2112E+08	0.8761E+10
5	1	-0.2604E+04	0.4133E+04	0.5271E+02	-0.4634E+02	0.5352E+02	-0.2605E+04	0.1329E+040.02		0.5878E+04	0.5271E+03	0.1151E+08	0.5355E+10
6	1	-0.2491E+04	0.3766E+04	-0.3463E+02	0.4509E+02	-0.3381E+02	-0.2492E+04	0.1229E+040.02		0.5461E+04	0.4133E+03	0.9933E+07	0.4362E+10
7	1	-0.1742E+04	0.3118E+04	-0.1609E+02	-0.3791E+02	-0.1525E+02	-0.1743E+04	0.8637E+030.02		0.4268E+04	0.4533E+03	0.6069E+07	0.2745E+10
8	1	-0.1892E+04	0.3340E+04	0.1746E+02	0.4479E+02	0.1851E+02	-0.1893E+04	0.9558E+030.02		0.4587E+04	0.4886E+03	0.7010E+07	0.3198E+10
9	1	-0.1333E+04	0.2817E+04	0.1618E+02	-0.3790E+02	0.1724E+02	-0.1334E+04	0.6759E+030.03		0.3667E+04	0.4999E+03	0.4482E+07	0.2055E+10
10	1	-0.1251E+04	0.2647E+04	-0.1792E+02	0.1435E+02	-0.1775E+02	-0.1251E+04	0.6165E+030.01		0.3451E+04	0.4596E+03	0.3979E+07	0.1787E+10
11	1	-0.8775E+03	0.2311E+04	-0.1361E+02	-0.2595E+02	-0.1284E+02	-0.8787E+03	0.4329E+030.03		0.2856E+04	0.4730E+03	0.2719E+07	0.1208E+10
12	1	-0.9481E+03	0.2431E+04	0.7919E+01	0.1494E+02	0.8153E+01	-0.9484E+03	0.4763E+030.02		0.3017E+04	0.4969E+03	0.3034E+07	0.1367E+10
13	1	-0.6455E+03	0.2152E+04	0.6555E+01	-0.2595E+02	0.9583E+01	-0.6461E+03	0.3276E+030.04		0.2534E+04	0.5050E+03	0.2140E+07	0.9401E+09
14	1	-0.5951E+03	0.2057E+04	-0.1162E+02	0.3842E+01	-0.1160E+02	-0.5951E+03	0.2918E+030.01		0.2414E+04	0.4835E+03	0.1942E+07	0.8403E+09
15	1	-0.3749E+03	0.1864E+04	-0.9495E+01	-0.1945E+02	-0.8819E+01	-0.3760E+03	0.1836E+030.05		0.2081E+04	0.4931E+03	0.1443E+07	0.5986E+09
16	1	-0.4177E+03	0.1935E+04	0.4364E+01	0.4010E+01	0.4902E+01	-0.4178E+03	0.2113E+030.01		0.2172E+04	0.5073E+03	0.1573E+07	0.6634E+09
17	1	-0.2267E+03	0.1773E+04	0.7084E+01	-0.1944E+02	0.8761E+01	-0.2284E+03	0.1166E+030.08		0.1893E+04	0.5176E+03	0.1195E+07	0.4769E+09
18	1	-0.1984E+03	0.1714E+04	-0.3479E+01	-0.1753E+01	-0.3464E+01	-0.1989E+03	0.9770E+020.01		0.1823E+04	0.5040E+03	0.1108E+07	0.4317E+09
19	1	-0.5341E+02	0.1600E+04	0.1271E+02	-0.1741E+02	0.1701E+02	-0.5771E+02	0.3736E+020.24		0.1622E+04	0.5199E+03	0.8765E+06	0.3142E+09
20	1	-0.8527E+02	0.1639E+04	0.8100E+01	0.1394E+01	0.8121E+01	-0.8529E+02	0.4671E+020.01		0.1680E+04	0.5207E+03	0.9409E+06	0.3475E+09
21	3	-0.5243E+04	0.6505E+04	0.4056E+02	0.4020E+02	0.4081E+02	-0.5241E+04	0.2641E+040.01		0.1019E+05	0.4350E+03	0.3461E+08	0.1359E+11
22	3	-0.5463E+04	0.6166E+04	-0.1757E+03	-0.2031E+03	-0.1180E+03	-0.5487E+04	0.2695E+040.04		0.1010E+05	0.1866E+03	0.3395E+08	0.1059E+11
23	1	-0.3375E+04	0.4811E+04	0.1618E+02	-0.7820E+01	0.1620E+02	-0.3370E+04	0.1693E+040.00		0.7120E+04	0.4650E+03	0.1693E+08	0.7829E+10
24	1	-0.3905E+04	0.5255E+04	0.7006E+02	-0.2398E+03	0.8449E+02	-0.3920E+04	0.2002E+040.06		0.7967E+04	0.4733E+03	0.2113E+08	0.8442E+10
25	1	-0.2633E+04	0.4114E+04	0.2435E+02	0.3540E+02	0.2884E+02	-0.2633E+04	0.1331E+040.01		0.5887E+04	0.5032E+03	0.1159E+08	0.5378E+10
26	1	-0.2491E+04	0.3765E+04	-0.3349E+02	-0.6616E+02	-0.3170E+02	-0.2493E+04	0.1231E+040.03		0.5460E+04	0.4133E+03	0.9934E+07	0.4350E+10
27	1	-0.1734E+04	0.3119E+04	-0.1064E+02	0.1866E+02	-0.1044E+02	-0.1734E+04	0.8620E+030.01		0.4262E+04	0.4582E+03	0.6054E+07	0.2735E+10
28	1	-0.1492E+04	0.3134E+04	0.1467E+02	-0.6662E+02	0.2099E+02	-0.1494E+04	0.9576E+030.03		0.4586E+04	0.4887E+03	0.7007E+07	0.3190E+10
29	1	-0.1146E+04	0.2819E+04	0.1486E+02	0.2031E+02	0.1316E+02	-0.1147E+04	0.6799E+030.01		0.3671E+04	0.4921E+03	0.4491E+07	0.2042E+10
30	1	-0.1251E+04	0.2644E+04	-0.1786E+02	-0.3486E+02	-0.1689E+02	-0.1252E+04	0.6176E+030.03		0.3450E+04	0.4590E+03	0.3967E+07	0.1783E+10
31	1	-0.8704E+03	0.2312E+04	-0.8577E+01	0.9335E+01	-0.8476E+01	-0.8710E+03	0.4312E+030.01		0.2851E+04	0.4775E+03	0.2710E+07	0.1202E+10
32	1	-0.9485E+03	0.2430E+04	0.8004E+01	-0.3426E+02	0.9229E+01	-0.9497E+03	0.4795E+030.04		0.3016E+04	0.4904E+03	0.3034E+07	0.1364E+10
33	1	-0.6535E+03	0.2146E+04	0.6434E+01	0.7047E+01	0.7022E+01	-0.6537E+03	0.3303E+030.01		0.2535E+04	0.4999E+03	0.2142E+07	0.9683E+09
34	1	-0.5955E+03	0.2056E+04	-0.1126E+02	-0.2398E+02	-0.1027E+02	-0.5963E+03	0.2930E+030.04		0.2413E+04	0.4832E+03	0.1941E+07	0.8387E+09
35	1	-0.3739E+03	0.1864E+04	-0.9426E+01	0.1501E+01	-0.9422E+01	-0.3730E+03	0.1840E+030.00		0.2078E+04	0.4954E+03	0.1439E+07	0.5947E+09
36	1	-0.4174E+03	0.1934E+04	0.5264E+01	-0.2341E+02	0.6600E+01	-0.4192E+03	0.2129E+030.06		0.2172E+04	0.5070E+03	0.1571E+07	0.6622E+09
37	1	-0.2414E+03	0.1765E+04	0.4914E+01	0.1750E+01	0.4927E+01	-0.2413E+03	0.1231E+030.01		0.1895E+04	0.5096E+03	0.1192E+07	0.4759E+09
38	1	-0.2004E+03	0.1712E+04	-0.6736E+01	-0.1868E+02	-0.4471E+01	-0.2022E+03	0.9986E+020.09		0.1823E+04	0.5017E+03	0.1104E+07	0.4315E+09
39	1	-0.5676E+02	0.1593E+04	-0.1032E+01	0.1013E+01	-0.1013E+01	-0.5678E+02	0.2788E+020.02		0.1623E+04	0.5117E+03	0.8776E+06	0.3152E+09
40	1	-0.8882E+02	0.1637E+04	0.5476E+01	-0.1545E+02	0.7897E+01	-0.8934E+02	0.4862E+020.16		0.1680E+04	0.5185E+03	0.9402E+06	0.3473E+09

TABLE VI. - Concluded. SAMPLE PROBLEM (3) - OUTPUT

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 2 - 3 OF 2

STRAIN ELEMENT DATA

NEL	RC	ZC	ER	ET	EZ	ERZ	LR	LZ	LT	L1 . L2	TL	TS	TR	EPEQ	NEL
1	1.07614	00.06664	-0.00796	0.00877	-0.00041	0.00000	0.9921	0.9996	1.0089	0.9996 0.9921	0.00	-0.00	00.00	0.00089	1
2	1.14212	00.13328	-0.00742	0.00784	-0.00036	0.00029	0.9927	0.9996	1.0079	0.9996 0.9927	0.00	00.00	00.00	0.00007	2
3	1.34111	00.06664	-0.00488	0.00578	-0.00041	-0.00006	0.9952	0.9996	1.0058	0.9996 0.9952	3.13	-0.00	00.00	0.00000	3
4	1.27440	00.13328	-0.00556	0.00636	-0.00036	0.00025	0.9945	0.9996	1.0064	0.9996 0.9945	0.00	00.00	00.00	0.00000	4
5	1.47386	00.06664	-0.00348	0.00487	-0.00041	-0.00006	0.9961	0.9996	1.0049	0.9996 0.9961	3.12	-0.00	00.00	0.00000	5
6	1.54028	00.13328	-0.00363	0.00450	-0.00042	0.00006	0.9964	0.9996	1.0045	0.9996 0.9964	0.00	00.00	00.00	0.00000	6
7	1.73966	00.06664	-0.00208	0.00343	-0.00043	-0.00005	0.9973	0.9996	1.0036	0.9996 0.9973	3.12	-0.00	00.00	0.00000	7
8	1.80718	00.13328	-0.00241	0.00388	-0.00042	0.00006	0.9971	0.9996	1.0039	0.9996 0.9971	0.00	00.00	00.00	0.00000	8
9	1.87207	00.06664	-0.00214	0.00320	-0.00043	-0.00005	0.9978	0.9996	1.0032	0.9996 0.9978	3.11	-0.00	00.00	0.00000	9
10	1.93919	00.13328	-0.00206	0.00302	-0.00044	0.00002	0.9980	0.9996	1.0030	0.9996 0.9980	0.00	00.00	00.00	0.00000	10
11	2.13844	00.06664	-0.00157	0.00257	-0.00044	-0.00003	0.9984	0.9996	1.0026	0.9996 0.9984	3.11	-0.00	00.00	0.00000	11
12	2.07228	00.13327	-0.00168	0.00270	-0.00044	0.00002	0.9983	0.9996	1.0027	0.9996 0.9983	0.00	00.00	00.00	0.00000	12
13	2.27198	00.06664	-0.00130	0.00234	-0.00044	-0.00003	0.9987	0.9996	1.0023	0.9996 0.9987	3.10	-0.00	00.00	0.00000	13
14	2.33856	00.13327	-0.00121	0.00223	-0.00045	0.00001	0.9988	0.9995	1.0022	0.9995 0.9988	0.00	00.00	00.00	0.00000	14
15	2.53815	00.06664	-0.00093	0.00197	-0.00046	-0.00003	0.9991	0.9995	1.0020	0.9995 0.9991	3.09	-0.00	00.00	0.00000	15
16	2.47175	00.13327	-0.00100	0.00205	-0.00045	0.00001	0.9990	0.9995	1.0021	0.9995 0.9990	0.00	00.00	00.00	0.00000	16
17	2.67157	00.06664	-0.00076	0.00183	-0.00046	-0.00003	0.9992	0.9995	1.0018	0.9995 0.9992	3.08	-0.00	00.00	0.00000	17
18	2.73819	00.13327	-0.00071	0.00177	-0.00046	-0.00000	0.9993	0.9995	1.0018	0.9995 0.9993	3.13	-0.00	00.00	0.00000	18
19	2.93807	00.06664	-0.00054	0.00161	-0.00045	-0.00002	0.9995	0.9995	1.0016	0.9995 0.9995	2.90	-0.00	00.00	0.00000	19
20	2.87143	00.13327	-0.00058	0.00166	-0.00046	0.00000	0.9994	0.9995	1.0017	0.9995 0.9994	0.00	00.00	00.00	0.00000	20
21	1.07614	00.33320	-0.00801	0.00876	-0.00040	0.00006	0.9921	0.9996	1.0089	0.9996 0.9921	0.00	00.00	00.00	0.00089	21
22	1.14232	00.26657	-0.00742	0.00783	-0.00034	-0.00027	0.9927	0.9997	1.0079	0.9997 0.9927	3.10	-0.00	00.00	0.00007	22
23	1.34110	00.33320	-0.00485	0.00578	-0.00042	-0.00001	0.9952	0.9996	1.0058	0.9996 0.9952	3.14	-0.00	00.00	0.00000	23
24	1.27450	00.26657	-0.00554	0.00636	-0.00034	-0.00031	0.9945	0.9997	1.0064	0.9997 0.9945	3.08	-0.00	00.00	0.00000	24
25	1.47346	00.33320	-0.00349	0.00487	-0.00042	0.00005	0.9961	0.9996	1.0049	0.9996 0.9961	0.00	00.00	00.00	0.00000	25
26	1.54028	00.26656	-0.00363	0.00450	-0.00042	-0.00004	0.9964	0.9996	1.0045	0.9996 0.9964	3.11	-0.00	00.00	0.00000	26
27	1.73965	00.33319	-0.00208	0.00343	-0.00043	0.00002	0.9973	0.9996	1.0036	0.9996 0.9973	0.00	00.00	00.00	0.00000	27
28	1.67318	00.26655	-0.00291	0.00388	-0.00042	-0.00009	0.9971	0.9996	1.0039	0.9996 0.9971	3.11	-0.00	00.00	0.00000	28
29	1.87266	00.33319	-0.00220	0.00320	-0.00043	0.00003	0.9978	0.9996	1.0032	0.9996 0.9978	0.00	00.00	00.00	0.00000	29
30	1.93919	00.26655	-0.00204	0.00302	-0.00044	-0.00005	0.9980	0.9996	1.0030	0.9996 0.9980	3.11	-0.00	00.00	0.00000	30
31	2.13843	00.33319	-0.00156	0.00257	-0.00044	0.00001	0.9984	0.9996	1.0026	0.9996 0.9984	0.00	00.00	00.00	0.00000	31
32	2.07228	00.26655	-0.00168	0.00270	-0.00044	-0.00004	0.9983	0.9996	1.0027	0.9996 0.9983	3.11	-0.00	00.00	0.00000	32
33	2.27198	00.33318	-0.00130	0.00233	-0.00044	0.00001	0.9987	0.9996	1.0023	0.9996 0.9987	0.00	00.00	00.00	0.00000	33
34	2.33856	00.26655	-0.00121	0.00223	-0.00045	-0.00003	0.9988	0.9996	1.0022	0.9996 0.9988	3.10	-0.00	00.00	0.00000	34
35	2.53835	00.33318	-0.00093	0.00197	-0.00045	0.00000	0.9991	0.9995	1.0020	0.9995 0.9991	0.00	00.00	00.00	0.00000	35
36	2.47174	00.26655	-0.00100	0.00205	-0.00045	-0.00003	0.9990	0.9996	1.0021	0.9996 0.9990	3.09	-0.00	00.00	0.00000	36
37	2.67157	00.33318	-0.00077	0.00183	-0.00045	0.00000	0.9992	0.9995	1.0018	0.9995 0.9992	0.00	00.00	00.00	0.00000	37
38	2.73818	00.26654	-0.00071	0.00177	-0.00046	-0.00002	0.9993	0.9995	1.0018	0.9995 0.9993	3.05	-0.00	00.00	0.00000	38
39	2.93806	00.33318	-0.00053	0.00161	-0.00046	0.00000	0.9995	0.9995	1.0016	0.9995 0.9995	0.00	00.00	00.00	0.00000	39
40	2.87143	00.26654	-0.00058	0.00166	-0.00046	-0.00002	0.9994	0.9995	1.0017	0.9995 0.9994	2.98	-0.00	00.00	0.00000	40

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
1	00.44860E+02	00.90139E+01	00.53974E+02	00.47102E+03
3	00.22233E+02	0.E+00	00.22233E+02	00.47098E+03
5	00.15137E+02	0.E+00	00.15137E+02	00.52713E+03
7	00.80153E+01	0.E+00	00.80153E+01	00.45329E+03
9	00.59782E+01	0.E+00	00.59782E+01	00.49989E+03
11	00.36699E+01	0.E+00	00.36699E+01	00.47299E+03
13	00.29359E+01	0.E+00	00.29359E+01	00.50501E+03
15	00.20224E+01	0.E+00	00.20224E+01	00.49310E+03
17	00.17144E+01	0.E+00	00.17144E+01	00.51764E+03
19	00.13022E+01	0.E+00	00.13022E+01	00.51986E+03
21	00.45103E+02	00.90394E+01	00.54142E+02	00.43501E+03
23	00.22110E+02	0.E+00	00.22110E+02	00.48562E+03
25	00.15169E+02	0.E+00	00.15169E+02	00.50321E+03
27	00.79971E+01	0.E+00	00.79971E+01	00.45817E+03
29	00.59634E+01	0.E+00	00.59634E+01	00.49211E+03
31	00.36597E+01	0.E+00	00.36597E+01	00.47751E+03
33	00.29349E+01	0.E+00	00.29349E+01	00.49991E+03
35	00.20179E+01	0.E+00	00.20179E+01	00.49541E+03
37	00.17128E+01	0.E+00	00.17128E+01	00.50963E+03
39	00.12981E+01	0.E+00	00.12981E+01	00.51174E+03

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
2	00.44281E+02	00.69812E+00	00.44979E+02	00.16560E+03
4	00.27621E+02	0.E+00	00.27621E+02	00.45190E+03
6	00.13025E+02	0.E+00	00.13025E+02	00.41332E+03
8	00.92592E+01	0.E+00	00.92592E+01	00.48857E+03
10	00.52874E+01	0.E+00	00.52874E+01	00.45957E+03
12	00.40924E+01	0.E+00	00.40924E+01	00.49689E+03
14	00.26654E+01	0.E+00	00.26654E+01	00.48348E+03
16	00.21991E+01	0.E+00	00.21991E+01	00.50730E+03
18	00.15930E+01	0.E+00	00.15930E+01	00.50396E+03
20	00.13855E+01	0.E+00	00.13855E+01	00.52071E+03
22	00.44247E+02	00.69923E+00	00.44947E+02	00.18662E+03
24	00.27638E+02	0.E+00	00.27638E+02	00.47330E+03
26	00.13022E+02	0.E+00	00.13022E+02	00.41335E+03
28	00.92580E+01	0.E+00	00.92580E+01	00.48869E+03
30	00.52853E+01	0.E+00	00.52853E+01	00.45899E+03
32	00.40907E+01	0.E+00	00.40907E+01	00.49637E+03
34	00.26639E+01	0.E+00	00.26639E+01	00.48318E+03
36	00.21978E+01	0.E+00	00.21978E+01	00.50705E+03
38	00.15913E+01	0.E+00	00.15913E+01	00.50170E+03
40	00.13839E+01	0.E+00	00.13839E+01	00.51847E+03

THE ELASTIC ENERGY IS 00.7444A6E+02
THE PLASTIC ENERGY IS 00.262018E+01
THE TOTAL ENERGY IS 00.A1068BE+02FOR A LOAD OF 00.165883E+05
THIS IS INCREMENT 2 - 3 OF 2
THE APPLIED LOAD IS 165AA.3384THE INC. LOAD IS A0.9119

TAPE RESTART GENERATION...STEP 2 - 1 OF 2

TABLE VII. - SAMPLE PROBLEM (4) - INPUT

STATEMENT NUMBER (1–5) | CONT (6) | FORTRAN STATEMENT (7–72) | IDENTIFICATION (73–80)

```
    4   0    1    0    1    1    5    0
    2   0    1    1    1
    1   0
    4
   0.005  0.005
```

NASA-C-836 (REV. 9-14-59)

CD-6725

TABLE VIII. - SAMPLE PROBLEM (4) - OUTPUT

```
   4    0    1    0    1    1    5    0
   2    0    1    1    1
RESTART FROM TAPE
   1    0
   4
PROBLEM EXTENDED FROM   2 TO   4 STEPS
THE NEW TO VECTOR IS
0.00500   0.00007   0.00500   0.00500


STATE MAP  STEP    3 -     1

    3    3    1    2    1    1    1    1    1    1
    1    1    1    1    1    1    1    1    1    1
    3    3    1    2    1    1    1    1    1    1
    1    1    1    1    1    1    1    1    1    1
```

TOTAL DISPLACEMENTS

0.01282889	0.00000000	0.01055274	0.00000000	0.00932126	0.00000000	0.00833963	0.00000000	0.00766440	0.00000000
0.00711165	0.00000000	0.00571397	0.00000000	0.00634602	0.00000000	0.00615032	0.00000000	0.00595874	0.00000000
0.00582365	0.00000000	0.01282889	-.00002716	0.01070309	-.00003730	0.00928769	-.00004134	0.00837489	-.00004602
0.00763931	-.00010316	0.00712172	-.00010495	0.00669492	-.00010720	0.00638818	-.00010924	0.00613465	-.00011161
0.00595494	-.00011196	0.00580922	-.00010933	0.01282889	-.00005212	0.01056103	-.00006438	0.00939366	-.00016816
0.00834303	-.00019403	0.00766114	-.00020214	0.00710024	-.00020946	0.00670304	-.00021291	0.00637204	-.00021818
0.00613630	-.00022154	0.00594024	-.00022453	0.00550612	-.00022241				

INCREMENTAL DISPLACEMENTS

0.00282889	0.00000000	0.00212575	0.00000000	0.00186279	0.00000000	0.00165219	0.00000000	0.00151103	0.00000000
0.00139467	0.00000000	0.00131026	0.00000000	0.00124092	0.00000000	0.00119130	0.00000000	0.00115169	0.00000000
0.00112415	0.00000000	0.00282889	0.00005528	0.00216989	0.00003530	0.00185328	-.00000017	0.00165183	-.00001282
0.00150562	-.00001739	0.00139569	-.00001758	0.00130468	-.00001853	0.00123961	-.00001924	0.00113595	-.00002029
0.00114866	-.00002337	0.00111678	-.00001907	0.00282889	0.00011126	0.00214355	0.00007517	0.00184455	-.00000379
0.00166214	-.00002754	0.00151327	-.00003115	0.00139071	-.00003483	0.00130575	-.00003607	0.00123457	-.00003825
0.00118492	-.00003977	0.00114330	-.00004100	0.00111033	-.00003978				

INCREMENTAL FORCES

799.8	91.1	-0.0	83.5	-0.0	-143.4	-0.0	-29.2	-0.0	11.5
0.0	16.2	-0.0	10.5	-0.0	9.2	-0.0	4.0	-0.0	-8.3
00.0	-45.0	1851.4	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	00.0	-0.0	00.0	00.0	00.0	-0.0	-0.0	00.0
-0.0	-0.0	00.0	00.0	878.3	-0.0	-0.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

TOTAL FORCES

4575.3	50.0	-0.0	211.1	-0.0	-199.7	-0.0	-15.6	-0.0	13.2
-0.0	17.9	-0.0	18.7	-0.0	13.3	-0.0	9.6	-0.0	-18.1
00.0	-100.5	10821.4	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	-0.0	00.0
-0.0	-0.0	00.0	00.0	4521.3	-0.0	-0.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

NODAL COORDINATES

1.012829	0.000000	1.210553	0.000000	1.409321	0.000000	1.606340	0.000000	1.807664	0.000000
2.007112	0.000000	2.206714	0.000000	2.406346	0.000000	2.606150	0.000000	2.805959	0.000000
3.005824	0.000000	1.012829	00.199973	1.210703	00.199963	1.409288	00.199919	1.606375	00.199904
1.807639	00.199897	2.007122	00.199895	2.206695	00.199893	2.406388	00.199891	2.605135	00.199888
2.805955	00.199888	3.005809	00.199891	1.012829	00.399948	1.210561	00.399936	1.409340	00.399832
1.606343	00.399836	1.807661	00.399798	2.007100	00.399791	2.206703	00.399787	2.405372	00.399782
2.606136	00.399778	2.805940	00.399775	3.005806	00.399778				

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 3 - 1 OF 4

STRESS ELEMENT DATA

NEL	IRV	SR	ST	SZ	SRZ	S1	S2	S12	TS	SIGEQ	S	J2	J3
1	3	-0.6392E+04	0.5740E+04	-0.7446E+02	0.E+00	-0.7446E+02	-0.6392E+04	0.3159E+040.00	0.1051E+05	-0.2424E+03	0.3682E+08	-0.6177E+10	
2	3	-0.6825E+04	0.5197E+04	-0.5336E+03	0.1480E+03	-0.5274E+03	-0.6832E+04	0.3152E+040.03	0.1042E+05	-0.7208E+03	0.3619E+08	-0.6763E+10	
3	1	-0.4346E+04	0.5995E+04	0.4816E+02	-0.6420E+02	0.4911E+02	-0.4346E+04	0.2215E+040.01	0.8986E+04	0.5793E+03	0.2691E+08	0.1310E+11	
4	2	-0.5633E+04	0.6590E+04	0.2206E+03	0.2059E+03	0.2885E+03	-0.5041E+04	0.2665E+040.04	0.1008E+05	0.6125E+03	0.3385E+08	0.1120E+11	
5	1	-0.3324E+04	0.5157E+04	0.1422E+03	-0.6475E+02	0.1434E+03	-0.3328E+04	0.1736E+040.02	0.7388E+04	0.6573E+03	0.1819E+08	0.9234E+10	
6	1	-0.3179E+04	0.4560E+04	-0.6472E+02	0.3979E+02	-0.2822E+02	-0.3176E+04	0.1574E+040.01	0.6449E+04	0.4920E+03	0.1563E+08	0.6000E+10	
7	1	-0.2221E+04	0.3854E+04	-0.2536E+02	-0.4835E+02	-0.2432E+02	-0.2230E+04	0.1103E+040.02	0.5344E+04	0.5365E+03	0.9515E+07	0.5169E+10	
8	1	-0.2424E+04	0.4144E+04	0.3450E+02	0.5425E+02	0.3569E+02	-0.2430E+04	0.1233E+040.02	0.5753E+04	0.5833E+03	0.1103E+08	0.5087E+10	
9	1	-0.1715E+04	0.3487E+04	0.1571E+02	-0.4533E+02	0.1706E+02	-0.1717E+04	0.8669E+030.03	0.4590E+04	0.5959E+03	0.7029E+07	0.3677E+10	
10	1	-0.1617E+04	0.3273E+04	-0.2603E+02	0.1595E+02	-0.2787E+02	-0.1617E+04	0.7946E+030.01	0.4320E+04	0.5427E+03	0.6222E+07	0.3365E+10	
11	1	-0.1145E+04	0.2854E+04	-0.2180E+02	-0.3670E+02	-0.2060E+02	-0.1141E+04	0.5603E+030.03	0.3570E+04	0.5642E+03	0.4245E+07	0.2287E+10	
12	1	-0.1234E+04	0.3004E+04	0.6610E+01	0.1505E+02	0.6793E+01	-0.1235E+04	0.6197E+030.01	0.3773E+04	0.5927E+03	0.4744E+07	0.2579E+10	
13	1	-0.8401E+03	0.2659E+04	0.9550E+01	-0.3669E+02	0.1113E+02	-0.8417E+03	0.4204E+030.04	0.3162E+04	0.6095E+03	0.3331E+07	0.1782E+10	
14	1	-0.7774E+03	0.2540E+04	-0.1786E+02	0.1567E+00	-0.1786E+02	-0.7778E+03	0.3400E+030.00	0.3011E+04	0.5814E+03	0.3021E+07	0.1595E+10	
15	1	-0.4429E+03	0.2302E+04	-0.1540E+02	-0.3017E+02	-0.1350E+02	-0.4434E+03	0.2407E+030.06	0.2590E+04	0.5479E+03	0.2235E+07	0.1140E+10	
16	1	-0.5496E+03	0.2390E+04	0.5576E+01	-0.3307E+00	0.5576E+01	-0.5496E+03	0.2776E+030.00	0.2705E+04	0.6153E+03	0.2453E+07	0.1260E+10	
17	1	-0.2971E+03	0.2193E+04	0.1043E+02	-0.3015E+02	0.1336E+02	-0.3003E+03	0.1566E+030.10	0.2352E+04	0.6352E+03	0.1843E+07	0.9075E+09	
18	1	-0.2633E+03	0.2114E+04	-0.3635E+01	-0.7946E+01	-0.3193E+01	-0.2642E+03	0.1305E+030.03	0.2264E+04	0.6173E+03	0.1709E+07	0.8215E+09	
19	1	-0.1234E+02	0.1944E+04	0.2672E+02	-0.2777E+02	0.3398E+02	-0.7964E+02	0.5681E+020.26	0.2009E+04	0.6461E+03	0.1345E+07	0.5954E+09	
20	1	-0.1163E+03	0.2029E+04	0.1396E+02	-0.2134E+01	0.1369E+02	-0.1164E+03	0.6503E+020.02	0.2043E+04	0.6420E+03	0.1446E+07	0.6606E+09	
21	3	-0.6352E+04	0.5807E+04	-0.4334E+02	-0.4332E+02	-0.4302E+02	-0.6352E+04	0.3155E+040.01	0.1053E+05	-0.1903E+03	0.3693E+08	-0.5650E+10	
22	3	-0.6788E+04	0.5227E+04	-0.4883E+03	-0.2272E+03	-0.4601E+03	-0.6796E+04	0.3164E+040.04	0.1042E+05	-0.6703E+03	0.3612E+08	-0.7507E+10	
23	1	-0.4284E+04	0.6018E+04	0.8447E+02	-0.9927E+02	0.8673E+02	-0.4291E+04	0.2189E+040.02	0.8962E+04	0.6044E+03	0.2675E+08	0.1377E+11	
24	2	-0.5603E+04	0.6622E+04	0.1503E+03	-0.3543E+03	0.3743E+03	-0.5027E+04	0.2701E+040.07	0.1010E+05	0.6506E+03	0.3365E+08	0.1034E+11	
25	1	-0.3441E+04	0.5104E+04	0.6686E+02	0.5052E+02	0.6534E+02	-0.3442E+04	0.1754E+040.01	0.7440E+04	0.5758E+03	0.1843E+08	0.9297E+10	
26	1	-0.3181E+04	0.4676E+04	-0.4174E+02	-0.4969E+02	-0.3922E+02	-0.3184E+04	0.1572E+040.03	0.6452E+04	0.4843E+03	0.1564E+08	0.8082E+10	
27	1	-0.2266E+04	0.3856E+04	-0.1655E+02	0.2944E+02	-0.1624E+02	-0.2262E+04	0.1123E+040.01	0.5361E+04	0.5201E+03	0.9573E+07	0.5036E+10	
28	1	-0.2434E+04	0.4140E+04	0.2141E+02	-0.7515E+02	0.2371E+02	-0.2437E+04	0.1230E+040.03	0.5755E+04	0.5756E+03	0.1103E+08	0.5944E+10	

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

29	1-0.176[illegible]E+04	0.3472E+04	0.1475E+02	0.2797E+02	0.1919E+02	-0.1760E+04	0.8847E+030.02	0.4608E+04	0.5771E+03	0.7076E+07	0.3778E+10				
30	1-0.1617E+04	0.3272E+04	-0.2620E+02	-0.4482E+02	-0.2494E+02	-0.1618E+04	0.7965E+030.03	0.4319E+04	0.5424E+03	0.6217E+07	0.3353E+10				
31	1-0.1134E+04	0.2455E+04	-0.1740E+02	0.9008E+01	-0.1237E+02	-0.1135E+04	0.5611E+030.01	0.3564E+04	0.5095E+03	0.4283E+07	0.2206E+10				
32	1-0.1232E+04	0.3003E+04	0.4504E+01	-0.4564E+02	0.1014E+02	-0.1234E+04	0.6220E+030.04	0.3772E+04	0.5430E+03	0.4740E+07	0.2571E+10				
33	1-0.8504E+03	0.2850E+04	0.4702E+01	0.5513E+01	0.4737E+01	-0.8549E+03	0.4336E+030.01	0.4165E+04	0.5999E+03	0.3334E+07	0.1767E+10				
34	1-0.7774E+03	0.3534E+04	-0.1647E+02	-0.3507E+02	-0.1481E+02	-0.7795E+03	0.3823E+030.05	0.3009E+04	0.5814E+03	0.3017E+07	0.1590E+10				
35	1-0.4490E+03	0.2102E+04	-0.6107E+01	-0.3305E+01	-0.6285E+01	-0.4490E+03	0.2421E+030.01	0.2585E+04	0.6017E+03	0.2227E+07	0.1124E+10				
36	1-0.5496E+03	0.2834E+04	0.7071E+01	-0.3555E+02	0.9332E+01	-0.5511E+03	0.2800E+030.06	0.2704E+04	0.6153E+03	0.2435E+07	0.1296E+10				
37	1-0.3249E+03	0.2179E+04	0.6543E+01	-0.2543E+01	0.6563E+01	-0.3249E+03	0.1657E+030.01	0.2350E+04	0.6203E+03	0.1850E+07	0.9042E+09				
38	1-0.2006E+03	0.2115E+04	-0.8540E+01	-0.2908E+02	-0.5308E+01	-0.2701E+03	0.1324E+030.11	0.2204E+04	0.6130E+03	0.1707E+07	0.9212E+09				
39	1-0.7407E+02	0.1979E+04	0.1849E+01	-0.1849E+01	0.1943E+01	-0.7911E+02	0.4053E+020.02	0.2010E+04	0.6311E+03	0.1347E+07	0.9985E+09				
40	1-0.1194E+03	0.2024E+04	0.8815E+01	-0.2326E+02	0.1272E+02	-0.1233E+03	0.6401E+020.17	0.2083E+04	0.6378E+03	0.1443E+07	0.9603E+09				

SAMPLE PROBLEM 1 EXPANSION OF A THICK WALL TUBE STEP 3 - 1 OF 4

STRAIN ELEMENT DATA

NEL	RC	ZC	ER	ET	EZ	ERZ	LR	LZ	LT	L1	L2	TL	TS	TR	EPEQ	NEL
1	1.07874	00.06666	-0.01158	0.01113	-0.00014	0.00000	0.9886	0.9999	1.0113	0.9999	0.9886	0.00	-0.00	00.00	0.01440	1
2	1.14469	00.13331	-0.01040	0.00988	-0.00019	0.00036	0.9894	0.9998	1.0100	0.9998	0.9894	0.00	00.00	00.00	0.00321	2
3	1.34335	00.06664	-0.00821	0.00721	-0.00041	-0.00008	0.9938	0.9996	1.0073	0.9996	0.9938	3.13	-0.00	00.00	0.00000	3
4	1.27885	00.13329	-0.00715	0.00794	-0.00019	0.00027	0.9929	0.9998	1.0080	0.9998	0.9929	0.00	00.00	00.00	0.00000	4
5	1.47585	00.06664	-0.00494	0.00607	-0.00041	-0.00006	0.9951	0.9996	1.0061	0.9996	0.9951	3.12	-0.00	00.00	0.00000	5
6	1.54280	00.13327	-0.00480	0.00561	-0.00048	0.00005	0.9954	0.9995	1.0057	0.9995	0.9954	0.00	00.00	00.00	0.00000	6
7	1.74121	00.06663	-0.00339	0.00452	-0.00052	-0.00006	0.9966	0.9995	1.0045	0.9995	0.9966	3.12	-0.00	00.00	0.00000	7
8	1.67474	00.13327	-0.00370	0.00484	-0.00048	0.00007	0.9963	0.9995	1.0049	0.9995	0.9963	0.00	00.00	00.00	0.00000	8
9	1.87414	00.06663	-0.00278	0.00398	-0.00052	-0.00006	0.9972	0.9995	1.0040	0.9995	0.9972	3.11	-0.00	00.00	0.00000	9
10	1.94062	00.13326	-0.00260	0.00375	-0.00053	0.00002	0.9974	0.9995	1.0038	0.9995	0.9974	0.00	00.00	00.00	0.00000	10
11	2.14017	00.06663	-0.00199	0.00319	-0.00054	-0.00005	0.9980	0.9995	1.0032	0.9995	0.9980	3.11	-0.00	00.00	0.00000	11
12	2.07364	00.13326	-0.00214	0.00336	-0.00053	0.00002	0.9979	0.9995	1.0034	0.9995	0.9979	0.00	00.00	00.00	0.00000	12
13	2.27326	00.06663	-0.00164	0.00290	-0.00054	-0.00005	0.9984	0.9995	1.0029	0.9995	0.9984	3.10	-0.00	00.00	0.00000	13
14	2.33962	00.13326	-0.00154	0.00277	-0.00055	0.00000	0.9985	0.9995	1.0028	0.9995	0.9985	0.00	00.00	00.00	0.00000	14
15	2.53956	00.06663	-0.00118	0.00245	-0.00056	-0.00004	0.9988	0.9994	1.0025	0.9994	0.9988	3.08	-0.00	00.00	0.00000	15
16	2.47247	00.13326	-0.00127	0.00255	-0.00055	-0.00000	0.9987	0.9995	1.0026	0.9995	0.9987	0.00	-0.00	00.00	0.00000	16
17	2.67275	00.06663	-0.00096	0.00227	-0.00056	-0.00004	0.9990	0.9994	1.0023	0.9994	0.9990	3.04	-0.00	00.00	0.00000	17
18	2.73935	00.13326	-0.00090	0.00219	-0.00056	-0.00001	0.9991	0.9994	1.0022	0.9994	0.9991	3.11	-0.00	00.00	0.00000	18
19	2.93920	00.06663	-0.00068	0.00199	-0.00055	-0.00004	0.9993	0.9995	1.0020	0.9995	0.9993	2.89	-0.00	00.00	0.00000	19
20	2.87257	00.13326	-0.00073	0.00205	-0.00056	-0.00000	0.9993	0.9994	1.0021	0.9994	0.9993	3.13	-0.00	00.00	0.00000	20
21	1.07874	00.33329	-0.01154	0.01113	-0.00012	-0.00003	0.9887	0.9999	1.0113	0.9999	0.9887	3.14	-0.00	00.00	0.01433	21
22	1.14470	00.26662	-0.01080	0.00988	-0.00014	-0.00034	0.9894	0.9999	1.0100	0.9999	0.9894	3.11	-0.00	00.00	0.00322	22
23	1.34336	00.33323	-0.00816	0.00722	-0.00043	-0.00013	0.9939	0.9996	1.0073	0.9996	0.9939	3.12	-0.00	00.00	0.00000	23
24	1.27885	00.26661	-0.00715	0.00794	-0.00014	-0.00047	0.9929	0.9999	1.0080	0.9999	0.9929	3.07	-0.00	00.00	0.00000	24
25	1.47586	00.33319	-0.00502	0.00607	-0.00043	0.00007	0.9950	0.9996	1.0061	0.9996	0.9950	0.00	00.00	00.00	0.00000	25
26	1.54280	00.26654	-0.00460	0.00561	-0.00049	-0.00012	0.9954	0.9995	1.0057	0.9995	0.9954	3.11	-0.00	00.00	0.00000	26
27	1.74121	00.33317	-0.00343	0.00452	-0.00050	0.00003	0.9966	0.9995	1.0045	0.9995	0.9966	0.00	00.00	00.00	0.00000	27
28	1.67479	00.26654	-0.00370	0.00484	-0.00049	-0.00010	0.9963	0.9995	1.0049	0.9995	0.9963	3.11	-0.00	00.00	0.00000	28
29	1.87413	00.33316	-0.00282	0.00398	-0.00050	0.00004	0.9972	0.9995	1.0040	0.9995	0.9972	0.00	00.00	00.00	0.00000	29
30	1.94062	00.26653	-0.00260	0.00375	-0.00052	-0.00006	0.9974	0.9995	1.0038	0.9995	0.9974	3.11	-0.00	00.00	0.00000	30
31	2.14017	00.33316	-0.00199	0.00319	-0.00053	0.00001	0.9980	0.9995	1.0032	0.9995	0.9980	0.00	00.00	00.00	0.00000	31
32	2.07364	00.26653	-0.00214	0.00336	-0.00052	-0.00006	0.9979	0.9995	1.0034	0.9995	0.9979	3.10	-0.00	00.00	0.00000	32
33	2.27326	00.33315	-0.00166	0.00289	-0.00053	0.00001	0.9983	0.9995	1.0029	0.9995	0.9983	0.00	00.00	00.00	0.00000	33
34	2.33962	00.26652	-0.00154	0.00277	-0.00054	-0.00005	0.9985	0.9995	1.0028	0.9995	0.9985	3.10	-0.00	00.00	0.00000	34
35	2.53955	00.33315	-0.00118	0.00244	-0.00055	-0.00000	0.9988	0.9995	1.0025	0.9995	0.9988	3.12	-0.00	00.00	0.00000	35
36	2.47246	00.26652	-0.00127	0.00254	-0.00054	-0.00005	0.9987	0.9995	1.0026	0.9995	0.9987	3.08	-0.00	00.00	0.00000	36
37	2.67274	00.33315	-0.00096	0.00227	-0.00055	-0.00000	0.9990	0.9995	1.0023	0.9995	0.9990	3.13	-0.00	00.00	0.00000	37
38	2.73934	00.26652	-0.00090	0.00219	-0.00056	-0.00004	0.9991	0.9994	1.0022	0.9994	0.9991	3.03	-0.00	00.00	0.00000	38
39	2.93919	00.33315	-0.00067	0.00199	-0.00057	-0.00000	0.9993	0.9994	1.0020	0.9994	0.9993	3.12	-0.00	00.00	0.00000	39
40	2.87257	00.26652	-0.00073	0.00205	-0.00056	-0.00003	0.9993	0.9994	1.0021	0.9994	0.9993	2.97	-0.00	00.00	0.00000	40

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
1	00.47699E+02	00.44610E+02	00.92509E+02	-0.24237E+03
3	00.35195E+02	0.E+00	00.35195E+02	00.57927E+03
5	00.23913E+02	0.E+00	00.23913E+02	00.65728E+03
7	00.12546E+02	0.E+00	00.12546E+02	00.53653E+03
9	00.93419E+01	0.E+00	00.93419E+01	00.59586E+03
11	00.57127E+01	0.E+00	00.57127E+01	00.60416E+03
13	00.45547E+01	0.E+00	00.45547E+01	00.60947E+03
15	00.31216E+01	0.E+00	00.31216E+01	00.59794E+03
17	00.26369E+01	0.E+00	00.26369E+01	00.63525E+03
19	00.19999E+01	0.E+00	00.19999E+01	00.64611E+03
21	00.44043E+02	00.44617E+02	00.92111E+02	-0.19626E+03
23	00.35020E+02	0.E+00	00.35020E+02	00.60436E+03
25	00.24144E+02	0.E+00	00.24144E+02	00.57579E+03
27	00.12619E+02	0.E+00	00.12619E+02	00.52610E+03
29	00.94021E+01	0.E+00	00.94021E+01	00.57709E+03
31	00.56983E+01	0.E+00	00.56983E+01	00.59946E+03
33	00.45563E+01	0.E+00	00.45563E+01	00.59994E+03
35	00.31120E+01	0.E+00	00.31120E+01	00.60170E+03
37	00.26359E+01	0.E+00	00.26359E+01	00.62026E+03
39	00.19901E+01	0.E+00	00.19901E+01	00.63110E+03

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDR). TENS.
2	00.47370E+02	00.32455E+02	00.79825E+02	-0.72383E+03
4	00.44296E+02	0.E+00	00.44296E+02	00.61246E+03
6	00.20471E+02	0.E+00	00.20471E+02	00.49202E+03
8	00.14544E+02	0.E+00	00.14544E+02	00.58334E+03
10	00.82651E+01	0.E+00	00.82651E+01	00.54267E+03
12	00.63787E+01	0.E+00	00.63787E+01	00.59270E+03
14	00.41306E+01	0.E+00	00.41306E+01	00.58143E+03
16	00.33977E+01	0.E+00	00.33977E+01	00.61528E+03
18	00.24501E+01	0.E+00	00.24501E+01	00.61727E+03
20	00.21274E+01	0.E+00	00.21274E+01	00.64197E+03
22	00.47303E+02	00.32553E+02	00.79856E+02	-0.67530E+03
24	00.44439E+02	0.E+00	00.44439E+02	00.65563E+03
26	00.20483E+02	0.E+00	00.20483E+02	00.48428E+03
28	00.14550E+02	0.E+00	00.14550E+02	00.57536E+03
30	00.82609E+01	0.E+00	00.82609E+01	00.54286E+03
32	00.63756E+01	0.E+00	00.63756E+01	00.59101E+03
34	00.41271E+01	0.E+00	00.41271E+01	00.58137E+03
36	00.33946E+01	0.E+00	00.33946E+01	00.61530E+03
38	00.24463E+01	0.E+00	00.24463E+01	00.61704E+03
40	00.21237E+01	0.E+00	00.21237E+01	00.63782E+03

THE ELASTIC ENERGY IS 00.110955E+03
THE PLASTIC ENERGY IS 00.211264E+02
THE TOTAL ENERGY IS 00.132081E+03FOR A LOAD OF 00.199179E+05
THIS IS INCREMENT 3 - 1 OF 4
THE APPLIED LOAD IS 19917.8918THE INC. LOAD IS 3329.5532

SCALED STEP

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

STATE MAP STEP 3 - 2

3	3	2	3	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1
3	3	2	3	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1

TOTAL DISPLACEMENTS

0.0144804e	0.00000000	0.0117e57e	0.00000000	0.0103e141	0.00000000	0.00925178	0.00000000	0.0084e6e5	0.00000000
0.0078740e	0.00000000	0.0074.3e	0.00000000	0.007e6e52	0.00000000	0.00e6e2e6	0.00000000	0.00659912	0.00000000
0.0e943857	0.00000000	0.0144803e	0.00003766	0.0119e784	0.00000633	0.0102e748	-.00007315	0.00928709	-.00011351
0.00846756	-.00011458	0.007e8885	-.00011467	0.00741105	-.00011713	0.007e6758	-.00011949	0.00675374	-.00012e45
0.00658311	-.00012286	0.0064e053	-.00011932	0.0114e93e	0.00006785	0.01160155	0.00002607	0.01043766	-.00015117
0.00426e10	-.00021287	0.00e44751	-.00021e47	0.007e6537	-.00022e60	0.00741968	-.00023108	0.00704e25	-.00023e40
0.00678444	-.00024268	0.00e56e40	-.00024645	0.00641555	-.00024349				

INCREMENTAL DISPLACEMENTS

0.00165147	0.00000000	0.00121304	0.00000000	0.00104015	0.00000000	0.00091215	0.00000000	0.00083255	0.00000000
0.00076744	0.00000000	0.00071469	0.00000000	0.0006e650	0.00000000	0.00065254	0.00000000	0.00063034	0.00000000
0.00061492	0.00000000	0.00165147	0.00000442	0.00126475	0.00034363	0.00100979	0.00000419	0.00091221	-.00000750
0.00082524	-.00001042	0.00076713	-.00000972	0.00071614	-.00000993	0.00067939	-.00001021	0.00064909	-.00001064
0.00062613	-.00001088	0.00061141	-.00000999	0.00165147	0.00011998	0.00124052	0.00000945	0.00103e80	0.00001699
0.00092e67	-.00001e44	0.00e63e47	-.00001633	0.00076513	-.00001914	0.00071664	-.00001697	0.0006e7e21	-.00002023
0.00064920	-.00002115	0.00062466	-.00002193	0.00060944	-.00002107				

INCREMENTAL FORCES

457.1	49.2	-0.0	74.3	-0.0	-77.1	-0.0	-76.4	-0.0	29.6
-0.0	14.6	-0.0	11.3	-0.0	7.2	-0.0	3.0	-0.0	-5.6
00.0	-30.2	791.6	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	00.0	-0.0	00.0	00.0	-0.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	350.8	-0.0	0.0	-0.0	00.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	00.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

TOTAL FORCES

5032.4	99.2	-0.0	285.4	-0.0	-276.8	-0.0	-91.9	-0.0	42.8
-0.0	32.6	-0.0	30.0	-0.0	20.5	-0.0	12.5	-0.0	-23.7
00.0	-130.7	11612.9	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	-0.0	00.0
-0.0	-0.0	00.0	00.0	4872.1	-0.0	-0.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

NODAL COORDINATES

1.014480	0.000000	1.211766	0.000000	1.410361	0.000000	1.609252	0.000000	1.808497	0.000000
2.007879	0.000000	2.207434	0.000000	2.407067	0.000000	2.606803	0.000000	2.806589	0.000000
3.006439	0.000000	1.014480	00.200038	1.211988	00.200006	1.410297	00.199927	1.609287	00.199896
1.808468	00.199886	2.007889	00.199885	2.207411	00.199883	2.407068	00.199881	2.606787	00.199878
2.806583	00.199877	3.006421	00.199861	1.014480	00.400068	1.211802	00.400026	1.410408	00.399849
1.609269	00.399787	1.808495	00.399782	2.007865	00.399771	2.207420	00.399768	2.407046	00.399762
2.606784	00.399757	2.806565	00.399754	3.006416	00.399757				

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 3 - 2 OF 4

STRESS ELEMENT DATA

NEL	IRV	SR	ST	SZ	SRZ	S1	S2	S12	TS	SIGEQ	S	J2	J3
1	3	-0.7082E+04	0.5259E+04	-0.1479E+03	0.E+00	-0.1479E+03	-0.7082E+04	0.3467E+040.00		0.1071E+05	-0.6572E+03	0.3827E+08	-0.1936E+11
2	3	-0.7395E+04	0.4d06E+04	-0.6460E+03	0.2b06E+03	-0.6359E+03	-0.7400E+04	0.3382E+040.04		0.1059E+05	-0.1076E+04	0.373cE+08	-0.1599E+11
3	2	-0.5026E+04	0.5607E+04	0.1387E+03	-0.1236E+03	0.1117E+03	-0.5029E+04	0.2570E+040.02		0.1010E+05	0.5e35E+03	0.3399E+08	-0.1536E+11
4	3	-0.5461E+04	0.4323E+04	0.3496E+03	0.2436E+03	0.3e04E+03	-0.5472E+04	0.2916E+040.04		0.1021E+05	0.4037E+03	0.3472E+08	-0.1871E+10
5	1	-0.3783E+04	0.3710E+04	0.2122E+03	-0.1235E+03	0.2161E+03	-0.3787E+04	0.2001E+040.03		0.8258E+04	0.7130E+03	0.2272E+08	0.1125E+11
6	1	-0.3504E+04	0.5201E+04	-0.8504E+01	0.9752E+01	-0.8481E+01	-0.3504E+04	0.1748E+040.00		0.7587E+04	0.5629E+03	0.1919E+08	0.1078E+11
7	1	-0.2512E+04	0.4269E+04	-0.4181E+02	-0.5648E+02	-0.4051E+02	-0.2513E+04	0.1236E+040.02		0.5942E+04	0.5707E+03	0.1177E+08	0.997bE+10
8	1	-0.2713E+04	0.4590E+04	0.4551E+02	0.4873E+02	0.4038E+02	-0.2714E+04	0.13n0E+040.02		0.6388E+04	0.6409E+03	0.1361E+08	0.7d87E+10
9	1	-0.1938E+04	0.3d50E+04	0.6331E+01	-0.5e95E+02	0.7952E+01	-0.1938E+04	0.9727E+030.03		0.5101E+04	0.6403E+03	0.8671E+07	0.5242E+10
10	1	-0.1423E+04	0.3614E+04	-0.3412E+02	0.1671E+02	-0.3596E+02	-0.1423E+04	0.6937E+030.01		0.4000E+04	0.5850E+03	0.7681E+07	0.4532E+10
11	1	-0.1293E+04	0.3150E+04	-0.2469E+02	-0.4355E+02	-0.2719E+02	-0.1294E+04	0.6335E+030.03		0.3965E+04	0.6094E+03	0.5239E+07	0.3063E+10
12	1	-0.1195E+04	0.3315E+04	0.2447E+01	0.1409E+02	0.2d89E+01	-0.1196E+04	0.6992E+030.01		0.4191E+04	0.6407E+03	0.5854E+07	0.3477E+10
13	1	-0.9539E+03	0.2935E+04	0.6510E+01	-0.4354E+02	0.1048E+02	-0.9559E+03	0.4832E+030.05		0.3509E+04	0.6031E+03	0.4102E+07	0.2405E+10
14	1	-0.8444E+03	0.2602E+04	-0.2214E+02	-0.2515E+01	-0.2213E+02	-0.8544E+03	0.4311E+030.00		0.3340E+04	0.6320E+03	0.3719E+07	0.2153E+10
15	1	-0.5624E+03	0.2540E+04	-0.1406E+02	-0.3641E+02	-0.1658E+02	-0.5650E+03	0.2742E+030.07		0.2871E+04	0.6524E+03	0.2745E+07	0.1542E+10
16	1	-0.6271E+03	0.2637E+04	0.6523E+01	-0.3677E+01	0.5544E+01	-0.6271E+03	0.3163E+030.01		0.2999E+04	0.6719E+03	0.2997E+07	0.1701E+10
17	1	-0.3386E+03	0.2422E+04	0.1247E+02	-0.3641E+02	0.1428E+02	-0.3427E+03	0.1795E+030.10		0.2604E+04	0.6983E+03	0.2256E+07	0.1220E+10
18	1	-0.3026E+03	0.2342E+04	-0.3463E+01	-0.1235E+02	-0.2754E+01	-0.3031E+03	0.1502E+030.04		0.2506E+04	0.6780E+03	0.2094E+07	0.1110E+10
19	1	-0.8387E+02	0.2194E+04	0.3632E+02	-0.3453E+02	0.4553E+02	-0.9309E+02	0.6931E+020.26		0.2221E+04	0.7155E+03	0.1643E+07	0.3027E+09
20	1	-0.1135E+03	0.2241E+04	0.1733E+02	-0.4757E+01	0.1747E+02	-0.1353E+03	0.7640E+020.03		0.2304E+04	0.7077E+03	0.1769E+07	0.4923E+09
21	3	-0.6427E+04	0.5434E+04	-0.9226E+02	-0.9146E+02	-0.9102E+02	-0.6429E+04	0.3419E+040.01		0.1673E+05	-0.5284E+03	0.3835E+08	-0.1664E+11
22	3	-0.7332E+04	0.4454E+04	-0.5587E+03	-0.3129E+03	-0.5442E+03	-0.7346E+04	0.3481E+040.05		0.1059E+05	-0.1012E+04	0.372cE+08	-0.1681E+11
23	2	-0.4957E+04	0.6651E+04	0.1185E+03	-0.1279E+03	0.1217E+03	-0.4960E+04	0.2541E+040.03		0.1008E+05	0.6043E+03	0.3386E+08	0.1634E+11
24	3	-0.5405E+04	0.6367E+04	0.4417E+03	-0.4633E+03	0.4782E+03	-0.5445E+04	0.2962E+040.08		0.1023E+05	0.4068E+03	0.3467E+08	0.1704E+09
25	1	-0.3684E+04	0.3981E+04	0.1040E+03	0.9416E+02	0.1052E+03	-0.3986E+04	0.2046E+040.02		0.6360E+04	0.5837E+03	0.2329E+08	0.1190E+11
26	1	-0.3914E+04	0.5189E+04	-0.4678E+02	-0.9311E+02	-0.4327E+02	-0.3921E+04	0.1739E+040.03		0.7594E+04	0.5410E+03	0.1921E+08	0.1196E+11
27	1	-0.2594E+04	0.4248E+04	-0.2951E+02	0.4720E+02	0.2894E+02	-0.2594E+04	0.1285E+040.02		0.5990E+04	0.5402E+03	0.1196E+08	0.8627E+10
28	1	-0.2724E+04	0.4578E+04	0.8119E+01	-0.5405E+02	0.9186E+01	-0.2729E+04	0.1369E+040.02		0.6394E+04	0.6194E+03	0.1303E+08	0.5101E+10
29	1	-0.2906E+04	0.3981E+04	0.2196E+02	0.3843E+02	0.2269E+02	-0.2910E+04	0.1016E+040.02		0.5135E+04	0.6145E+03	0.8785E+07	0.3000E+10
30	1	-0.1822E+04	0.3613E+04	-0.3245E+02	-0.4745E+02	-0.3119E+02	-0.1824E+04	0.8982E+030.03		0.4799E+04	0.5802E+03	0.7674E+07	0.4511E+10
31	1	-0.1294E+04	0.3150E+04	-0.1546E+02	0.1040E+02	-0.1548E+02	-0.1290E+04	0.6372E+030.01		0.3960E+04	0.6140E+03	0.5227E+07	0.3045E+10
32	1	-0.1393E+04	0.3315E+04	0.6205E+01	-0.4995E+02	0.7984E+01	-0.1397E+04	0.7023E+030.04		0.4189E+04	0.6420E+03	0.5846E+07	0.3461E+10
33	1	-0.9787E+03	0.2923E+04	0.9486E+01	0.9408E+01	0.9401E+01	-0.9787E+03	0.4941E+030.00		0.3513E+04	0.6512E+03	0.4115E+07	0.2678E+10
34	1	-0.8464E+03	0.2801E+04	-0.1476E+02	-0.4175E+02	-0.1775E+02	-0.8862E+03	0.4342E+030.05		0.3334E+04	0.6322E+03	0.3713E+07	0.2144E+10
35	1	-0.5594E+03	0.2540E+04	-0.7166E+01	-0.6792E+01	-0.7082E+01	-0.5597E+03	0.2761E+030.01		0.2654E+04	0.6577E+03	0.2733E+07	0.1524E+10
36	1	-0.6265E+03	0.2636E+04	0.7475E+01	0.4290E+02	0.1046E+02	-0.6267E+03	0.3201E+030.07		0.2997E+04	0.6723E+03	0.2992E+07	0.1694E+10
37	1	-0.3759E+03	0.2404E+04	0.7457E+01	0.5809E+01	0.7945E+01	-0.3751E+03	0.1913E+030.02		0.2609E+04	0.6784E+03	0.2269E+07	0.1221E+10
38	1	-0.3054E+03	0.2334E+04	-0.9438E+01	0.3584E+02	-0.9868E+01	-0.3107E+03	0.1525E+030.12		0.2506E+04	0.6724E+03	0.2092E+07	0.1110E+10
39	1	-0.9258E+02	0.2176E+04	0.4059E+01	-0.4057E+01	0.4424E+01	-0.9299E+02	0.4481E+020.04		0.2222E+04	0.6958E+03	0.1646E+07	0.8977E+09
40	1	-0.1384E+03	0.2235E+04	0.1073E+02	-0.2825E+02	0.1548E+02	-0.1441E+03	0.7498E+020.18		0.2303E+04	0.7023E+03	0.1786E+07	0.8917E+09

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

SAMPLE PROBLEM 4 EXPANSION OF A THICK WALL TUBE STEP 3 - 2 OF 4

STRAIN ELEMENT DATA

NEL	RC	ZC	ER	ET	EZ	ERZ	LR	LZ	LT	L1	L2	TL	TS	TN	EPEQ	NEL
1	1.04024	00.06668	-0.01385	0.01249	0.00019	0.00000	0.9864	1.0002	1.0127	1.0002	0.9864	0.00	-0.00	00.00	0.00645	1
2	1.14064	00.13335	-0.01270	0.01106	0.00003	0.00049	0.9875	1.0000	1.0112	1.0000	0.9875	0.00	00.00	00.00	0.00492	2
3	1.34414	00.06664	-0.00710	0.00801	-0.00037	-0.00018	0.9940	0.9996	1.0081	0.9996	0.9930	3.12	-0.00	00.00	0.00300	3
4	1.27832	00.13331	-0.00856	0.00844	0.00003	0.00036	0.9915	1.0000	1.0090	1.0000	0.9915	0.00	00.00	00.00	0.00130	4
5	1.47844	00.06664	-0.00554	0.00673	-0.00037	-0.00016	0.9945	0.9996	1.0068	0.9996	0.9944	3.11	-0.00	00.00	0.00300	5
6	1.54245	00.13327	-0.00504	0.00621	-0.00052	0.00001	0.9949	0.9995	1.0063	0.9995	0.9949	0.00	00.00	00.00	0.00000	6
7	1.74237	00.06663	-0.00380	0.00500	-0.00057	-0.00007	0.9962	0.9994	1.0050	0.9994	0.9962	3.12	-0.00	00.00	0.00000	7
8	1.67567	00.13326	-0.00417	0.00536	-0.00052	0.00006	0.9959	0.9995	1.0054	0.9995	0.9959	0.00	00.00	00.00	0.00000	8
9	1.87445	00.06663	-0.00310	0.00441	-0.00057	-0.00007	0.9969	0.9994	1.0044	0.9994	0.9969	3.11	-0.00	00.00	0.00000	9
10	1.94141	00.13326	-0.00291	0.00415	-0.00057	0.00007	0.9971	0.9994	1.0042	0.9994	0.9971	0.00	00.00	00.00	0.00000	10
11	2.14041	00.06663	-0.00223	0.00353	-0.00059	-0.00006	0.9978	0.9994	1.0036	0.9994	0.9978	3.11	-0.00	00.00	0.00000	11
12	2.07439	00.13326	-0.00240	0.00372	-0.00057	0.00002	0.9976	0.9994	1.0037	0.9994	0.9976	0.00	00.00	00.00	0.00000	12
13	2.27347	00.06663	-0.00184	0.00321	-0.00059	-0.00006	0.9982	0.9994	1.0032	0.9994	0.9982	3.10	-0.00	00.00	0.00000	13
14	2.34652	00.13325	-0.00172	0.00306	-0.00060	-0.00000	0.9983	0.9994	1.0031	0.9994	0.9983	3.14	-0.00	00.00	0.00000	14
15	2.54022	00.06663	-0.00132	0.00271	-0.00061	-0.00005	0.9987	0.9994	1.0027	0.9994	0.9987	3.07	-0.00	00.00	0.00000	15
16	2.47364	00.13325	-0.00142	0.00281	-0.00060	-0.00000	0.9986	0.9994	1.0028	0.9994	0.9986	3.14	-0.00	00.00	0.00000	16
17	2.67339	00.06663	-0.00107	0.00251	-0.00061	-0.00005	0.9989	0.9994	1.0025	0.9994	0.9989	3.04	-0.00	00.00	0.00000	17
18	2.73949	00.13325	-0.00100	0.00242	-0.00061	-0.00002	0.9990	0.9994	1.0024	0.9994	0.9990	3.10	-0.00	00.00	0.00000	18
19	2.93342	00.06663	-0.00075	0.00220	-0.00060	-0.00004	0.9992	0.9994	1.0022	0.9994	0.9992	2.88	-0.00	00.00	0.00000	19
20	2.87320	00.13325	-0.00081	0.00227	-0.00061	-0.00001	0.9992	0.9994	1.0023	0.9994	0.9992	3.11	-0.00	00.00	0.00000	20
21	1.06825	00.33338	-0.01367	0.01250	0.00015	-0.00011	0.9866	1.0002	1.0127	1.0002	0.9866	3.13	-0.00	00.00	0.00527	21
22	1.14654	00.26669	-0.01270	0.01107	0.00010	-0.00056	0.9875	1.0001	1.0113	1.0001	0.9875	3.10	-0.00	00.00	0.00494	22
23	1.34417	00.33327	-0.00704	0.00803	-0.00039	-0.00017	0.9930	0.9996	1.0081	0.9996	0.9930	3.12	-0.00	00.00	0.00300	23
24	1.27853	00.26665	-0.00856	0.00845	0.00010	-0.00067	0.9915	1.0001	1.0090	1.0002	0.9915	3.06	-0.00	00.00	0.00133	24
25	1.47666	00.33319	-0.00574	0.00674	-0.00039	0.00012	0.9943	0.9996	1.0068	0.9996	0.9943	0.00	00.00	00.00	0.00300	25
26	1.54245	00.26654	-0.00504	0.00621	-0.00055	-0.00012	0.9949	0.9995	1.0063	0.9995	0.9949	3.11	-0.00	00.00	0.00000	26
27	1.74238	00.33315	-0.00388	0.00501	-0.00052	0.00006	0.9961	0.9995	1.0050	0.9995	0.9961	0.00	00.00	00.00	0.00000	27
28	1.67567	00.26652	-0.00412	0.00536	-0.00055	-0.00007	0.9959	0.9995	1.0054	0.9995	0.9959	3.12	-0.00	00.00	0.00300	28
29	1.87494	00.33315	-0.00318	0.00440	-0.00052	0.00005	0.9968	0.9995	1.0044	0.9995	0.9968	0.00	00.00	00.00	0.00000	29
30	1.94141	00.26651	-0.00291	0.00415	-0.00057	-0.00006	0.9971	0.9994	1.0042	0.9994	0.9971	3.12	-0.00	00.00	0.00000	30
31	2.14040	00.33314	-0.00224	0.00353	-0.00057	0.00001	0.9978	0.9994	1.0035	0.9994	0.9978	0.00	00.00	00.00	0.00000	31
32	2.07439	00.26651	-0.00240	0.00372	-0.00057	-0.00007	0.9976	0.9994	1.0037	0.9994	0.9976	3.11	-0.00	00.00	0.00000	32
33	2.27346	00.33314	-0.00186	0.00320	-0.00057	0.00001	0.9981	0.9994	1.0032	0.9994	0.9981	0.00	00.00	00.00	0.00000	33
34	2.34051	00.26651	-0.00172	0.00306	-0.00060	-0.00005	0.9983	0.9994	1.0031	0.9994	0.9983	3.09	-0.00	00.00	0.00000	34
35	2.54021	00.33313	-0.00132	0.00270	-0.00060	-0.00001	0.9987	0.9994	1.0027	0.9994	0.9987	3.13	-0.00	00.00	0.00000	35
36	2.47363	00.26651	-0.00142	0.00281	-0.00060	-0.00006	0.9986	0.9994	1.0028	0.9994	0.9986	3.07	-0.00	00.00	0.00000	36
37	2.67338	00.33313	-0.00110	0.00251	-0.00060	-0.00001	0.9989	0.9994	1.0025	0.9994	0.9989	3.13	-0.00	00.00	0.00000	37
38	2.73944	00.26650	-0.00100	0.00242	-0.00062	-0.00005	0.9990	0.9994	1.0024	0.9994	0.9990	3.02	-0.00	00.00	0.00000	38
39	2.93340	00.33313	-0.00075	0.00220	-0.00062	-0.00001	0.9993	0.9994	1.0022	0.9994	0.9993	3.10	-0.00	00.00	0.00000	39
40	2.87319	00.26650	-0.00081	0.00227	-0.00062	-0.00004	0.9992	0.9994	1.0023	0.9994	0.9992	2.96	-0.00	00.00	0.00000	40

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.	ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
1	00.50094E+02	00.66164E+02	00.11617E+03	-0.65721E+03	2	00.49305E+02	00.50229E+02	00.99534E+02	-0.10754E+04
3	00.44341E+02	0.E+00	00.44391E+02	00.56345E+03	4	00.45311E+02	00.13111E+02	00.58422E+02	00.40370E+03
5	00.29857E+02	0.E+00	00.29857E+02	00.71303E+03	6	00.25133E+02	0.E+00	00.25133E+02	00.56287E+03
7	00.15498E+02	0.E+00	00.15498E+02	00.57074E+03	8	00.17931E+02	0.E+00	00.17931E+02	00.64372E+03
9	00.11523E+02	0.E+00	00.11523E+02	00.64027E+03	10	00.10191E+02	0.E+00	00.10191E+02	00.58504E+03
11	00.70354E+01	0.E+00	00.70358E+01	00.60941E+03	12	00.78573E+01	0.E+00	00.78573E+01	00.64374E+03
13	00.55990E+01	0.E+00	00.55990E+01	00.66314E+03	14	00.50746E+01	0.E+00	00.50746E+01	00.63199E+03
15	00.36269E+01	0.E+00	00.36269E+01	00.65291E+03	16	00.41673E+01	0.E+00	00.41673E+01	00.67195E+03
17	00.32301E+01	0.E+00	00.32301E+01	00.64845E+03	18	00.29976E+01	0.E+00	00.29976E+01	00.67798E+03
19	00.24446E+01	0.E+00	00.24446E+01	00.71548E+03	20	00.26003E+01	0.E+00	00.26003E+01	00.70772E+03
21	00.50029E+02	00.64502E+02	00.11453E+03	-0.52838E+03	22	00.49207E+02	00.50454E+02	00.99661E+02	-0.10121E+04
23	00.44262E+02	0.E+00	00.44262E+02	00.60431E+03	24	00.45480E+02	00.13397E+02	00.58877E+02	00.46560E+03
25	00.30449E+02	0.E+00	00.30490E+02	00.58369E+03	26	00.25165E+02	0.E+00	00.25165E+02	00.54158E+03
27	00.15723E+02	0.E+00	00.15723E+02	00.54018E+03	28	00.17947E+02	0.E+00	00.17947E+02	00.61940E+03
29	00.11655E+02	0.E+00	00.11655E+02	00.61453E+03	30	00.10185E+02	0.E+00	00.10185E+02	00.58619E+03
31	00.70214E+01	0.E+00	00.70214E+01	00.61460E+03	32	00.78530E+01	0.E+00	00.78530E+01	00.64202E+03
33	00.56036E+01	0.E+00	00.56036E+01	00.65120E+03	34	00.50695E+01	0.E+00	00.50695E+01	00.63222E+03
35	00.38131E+01	0.E+00	00.38131E+01	00.65774E+03	36	00.41632E+01	0.E+00	00.41632E+01	00.67229E+03
37	00.32281E+01	0.E+00	00.32281E+01	00.67886E+03	38	00.29922E+01	0.E+00	00.29922E+01	00.67244E+03
39	00.24355E+01	0.E+00	00.24305E+01	00.69584E+03	40	00.25950E+01	0.E+00	00.25950E+01	00.70230E+03

THE ELASTIC ENERGY IS 00.129221E+03
THE PLASTIC ENERGY IS 00.360436E+02
THE TOTAL ENERGY IS 00.165265E+03 FOR A LOAD OF 00.215174E+05
THIS IS INCREMENT 3 - 2 OF 4
THE APPLIED LOAD IS 21517.4791 THE INC. LOAD IS 1599.4875

SCALED STEP

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

STATE MAP STEP 1 - 3

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     3     3     3     3     1     1     1     1     1     1
     1     1     1     1     1     1     1     1     1     1
     3     3     3     3     1     1     1     1     1     1
     1     1     1     1     1     1     1     1     1     1
```

TOTAL DISPLACEMENTS

0.01500000	0.00000000	0.01215549	0.00000000	0.01067421	0.00000000	0.00952649	0.00000000	0.00874794	0.00000000
0.00811033	0.00000000	0.00765047	0.00000000	0.00727143	0.00000000	0.00699926	0.00000000	0.00677879	0.00000000
0.00862354	0.00006303	0.01500000	0.00005944	0.01239244	0.00002246	0.01060767	-.00006826	0.00956456	-.00010419
0.00771742	-.00011824	0.00812036	-.00011741	0.00762067	-.00012009	0.00727215	-.00012251	0.00697905	-.00012569
0.00677203	-.00012509	0.00660445	-.00012226	0.01500000	0.00010723	0.01220112	0.00005935	0.01072950	-.00014084
0.00958699	-.00021530	0.00875086	-.00022262	0.00809640	-.00023401	0.00763578	-.00023741	0.00725186	-.00024435
0.00697450	-.00024496	0.00675269	-.00025298	0.00659671	-.00024972				

INCREMENTAL DISPLACEMENTS

0.00051964	0.00000000	0.00038971	0.00000000	0.00031280	0.00000000	0.00027471	0.00000000	0.00025049	0.00000000
0.00023124	0.00000000	0.00021661	0.00000000	0.00020491	0.00000000	0.00019640	0.00000000	0.00018967	0.00000000
0.00018497	0.00000000	0.00051954	0.00002228	0.00040460	0.00001613	0.00031019	0.00000469	0.00027746	-.00000056
0.00025036	-.00000271	0.00023151	-.00000274	0.00021582	-.00000296	0.00020458	-.00000303	0.00019531	-.00000324
0.00018592	-.00000324	0.00018383	-.00000294	0.00051964	0.00003937	0.00039456	0.00003328	0.00032184	0.00001033
0.00027983	-.00000343	0.00025305	-.00000415	0.00023103	-.00000541	0.00021608	-.00000553	0.00020360	-.00000598
0.00019501	-.00000627	0.00018779	-.00000652	0.00018316	-.00000624				

INCREMENTAL FORCES

106.3	5.4	-0.0	20.5	-0.0	-8.3	-0.0	-20.7	-0.0	1.8
-0.0	5.1	-0.0	3.4	-0.0	3.0	-0.0	1.2	-0.0	-1.6
00.0	-4.9	224.3	00.0	-0.0	-0.0	0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	-0.0	00.0	0.0	-0.0	00.0	00.0
-0.0	-0.0	00.0	00.0	61.0	-0.0	00.0	-0.0	-0.0	-0.0
0.0	-0.0	00.0	-0.0	00.0	00.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	-0.0	00.0				

TOTAL FORCES

5138.9	104.6	-0.0	305.9	-0.0	-285.1	-0.0	-112.6	-0.0	44.0
-0.0	37.7	-0.0	33.4	-0.0	23.5	-0.0	13.7	-0.0	-25.3
00.0	-146.6	11837.2	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	-0.0	00.0
-0.0	-0.0	00.0	00.0	4953.1	-0.0	-0.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

NODAL COORDINATES

1.015000	0.000000	1.212155	0.000000	1.410674	0.000000	1.609526	0.000000	1.808748	0.000000
2.008110	0.000000	2.207650	0.000000	2.407271	0.000000	2.606999	0.000000	2.806779	0.000000
3.006624	0.000000	1.015000	00.200060	1.212392	00.200022	1.410608	00.199932	1.609565	00.199896
1.608713	00.199884	2.008120	00.199883	2.207627	00.199880	2.407272	00.199877	2.606979	00.199874
2.806772	00.199874	3.006664	00.199876	1.015000	00.400107	1.212201	00.400059	1.410729	00.399859
1.609549	00.399785	1.808751	00.399777	2.008096	00.399766	2.207636	00.399763	2.407252	00.399756
2.606980	00.399751	2.806753	00.399747	3.006599	00.399750				

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 3 - 3 OF 4

STRESS ELEMENT DATA

NEL	IRV	SR	ST	SZ	SRZ	S1	S2	S12	TS	SIGEQ	S	J2	J3
1	3	-0.7249E+04	0.5159E+04	-0.1560E+03	0.0E+00	-0.1560E+03	-0.7240E+04	0.3542E+040.00		0.1077E+05	-0.7456E+03	0.3870E+08	-0.2262E+11
2	3	-0.7556E+04	0.4694E+04	-0.6773E+03	0.2034E+03	-0.6672E+03	-0.7560E+04	0.3446E+040.04		0.1064E+05	-0.1176E+04	0.3763E+08	-0.1666E+11
3	3	-0.5174E+04	0.4505E+04	0.8048E+02	-0.1240E+03	0.8340E+02	-0.5177E+04	0.2630E+040.02		0.1013E+05	0.4704E+03	0.3421E+08	0.1328E+11
4	3	-0.5821E+04	0.4211E+04	0.3624E+03	0.2446E+03	0.3624E+03	-0.5831E+04	0.2997E+040.04		0.1026E+05	0.3143E+03	0.3503E+08	-0.1334E+10
5	1	-0.3915E+04	0.3685E+04	0.2516E+03	-0.1246E+03	0.2555E+03	-0.3914E+04	0.2085E+040.03		0.8518E+04	0.7427E+03	0.2417E+08	0.1175E+11
6	1	-0.3628E+04	0.3355E+04	-0.4591E+00	0.4373E+01	-0.4534E+00	-0.3620E+04	0.1810E+040.00		0.7820E+04	0.5783E+03	0.2039E+08	0.1166E+11
7	1	-0.2595E+04	0.2439E+04	-0.4384E+02	-0.5740E+02	-0.4177E+02	-0.2596E+04	0.1277E+040.02		0.6122E+04	0.3644E+03	0.1249E+08	0.7585E+10
8	1	-0.2409E+04	0.1729E+04	0.5457E+02	0.5016E+02	0.5545E+02	-0.2407E+04	0.1431E+040.02		0.6585E+04	0.2657E+03	0.1445E+08	0.8496E+10
9	1	-0.2004E+04	0.1461E+04	0.6075E+01	-0.5767E+02	0.7741E+01	-0.2004E+04	0.1006E+040.03		0.5256E+04	0.2550E+03	0.9204E+07	0.5699E+10
10	1	-0.1998E+04	0.1717E+04	-0.3844E+02	0.1718E+02	-0.3826E+02	-0.1988E+04	0.9248E+030.01		0.4496E+04	0.5769E+03	0.6155E+07	0.4925E+10
11	1	-0.1334E+04	0.1323E+04	-0.3072E+02	-0.4545E+02	-0.2914E+02	-0.1341E+04	0.6557E+030.03		0.4084E+04	0.6229E+03	0.3559E+07	0.3354E+10
12	1	-0.1447E+04	0.3409E+04	0.1564E+01	0.1417E+02	0.1703E+01	-0.1447E+04	0.7242E+030.01		0.4318E+04	0.6547E+03	0.6214E+07	0.3780E+10
13	1	-0.9568E+03	0.3014E+04	0.4113E+01	-0.4544E+02	0.1014E+02	-0.9909E+03	0.5005E+030.05		0.3614E+04	0.6790E+03	0.4351E+07	0.2617E+10
14	1	-0.9176E+03	0.2881E+04	-0.2363E+02	-0.3263E+01	-0.2361E+02	-0.9176E+03	0.4470E+030.00		0.3440E+04	0.6467E+03	0.3944E+07	0.2343E+10
15	1	-0.5441E+03	0.2612E+04	-0.2029E+02	-0.3391E+02	-0.1761E+02	-0.5468E+03	0.2446E+030.07		0.2955E+04	0.6091E+03	0.2910E+07	0.1679E+10
16	1	-0.6212E+03	0.2712E+04	0.5391E+01	-0.4724E+01	0.5425E+01	-0.6513E+03	0.3264E+030.01		0.3087E+04	0.6866E+03	0.3177E+07	0.1852E+10
17	1	-0.3517E+03	0.2491E+04	0.1304E+02	-0.3490E+02	0.1715E+02	-0.3558E+03	0.1865E+030.11		0.2679E+04	0.7173E+03	0.2392E+07	0.1535E+10
18	1	-0.3147E+03	0.2405E+04	0.3431E+01	-0.1379E+02	0.2621E+01	-0.3153E+03	0.1563E+030.04		0.2579E+04	0.6960E+03	0.2217E+07	0.1208E+10
19	1	-0.5744E+02	0.2257E+04	0.3447E+02	-0.3672E+02	0.4933E+02	-0.9735E+02	0.7334E+020.26		0.2285E+04	0.7364E+03	0.1734E+07	0.8732E+09
20	1	-0.1411E+03	0.2305E+04	0.1849E+02	-0.5616E+01	0.1869E+02	-0.1413E+03	0.8002E+020.04		0.2370E+04	0.7274E+03	0.1873E+07	0.9712E+09
21	3	-0.7052E+04	0.5364E+04	-0.9866E+02	-0.9767E+02	-0.9729E+02	-0.7054E+04	0.3476E+040.01		0.1078E+05	-0.5943E+03	0.3875E+08	-0.1909E+11
22	3	-0.7408E+04	0.4751E+04	-0.5430E+03	-0.3170E+03	-0.5684E+03	-0.7500E+04	0.3466E+040.05		0.1064E+05	-0.1105E+04	0.3769E+08	-0.1952E+11
23	3	-0.5104E+04	0.4551E+04	0.9593E+02	-0.1444E+03	0.9994E+02	-0.5108E+04	0.2604E+040.03		0.1012E+05	0.5142E+03	0.3409E+08	0.1418E+11
24	3	-0.5561E+04	0.4261E+04	0.4512E+03	-0.4735E+03	0.4883E+03	-0.5598E+04	0.3041E+040.08		0.1027E+05	0.3837E+03	0.3495E+08	-0.2360E+10
25	1	-0.4134E+04	0.3802E+04	0.1378E+03	0.9218E+02	0.1394E+03	-0.4136E+04	0.2138E+040.02		0.8675E+04	0.6022E+03	0.2484E+08	0.1144E+11
26	1	-0.3637E+04	0.3341E+04	-0.4432E+02	-0.9714E+02	-0.4159E+02	-0.3640E+04	0.1794E+040.03		0.7429E+04	0.5534E+03	0.2042E+08	0.1199E+11
27	1	-0.2597E+04	0.4389E+04	-0.3044E+02	0.4909E+02	0.2953E+02	-0.2597E+04	0.1334E+040.02		0.6179E+04	0.5469E+03	0.1273E+08	0.7154E+10
28	1	-0.2424E+04	0.4711E+04	0.1052E+02	0.5329E+02	0.1152E+02	-0.2425E+04	0.1414E+040.02		0.6592E+04	0.6326E+03	0.1446E+08	0.8769E+10
29	1	-0.2087E+04	0.4434E+04	0.2485E+02	0.4122E+02	0.2486E+02	-0.2087E+04	0.1056E+040.02		0.5294E+04	0.6253E+03	0.9347E+07	0.5404E+10
30	1	-0.1867E+04	0.3716E+04	-0.3436E+02	-0.4033E+02	-0.3310E+02	-0.1868E+04	0.9274E+030.03		0.4945E+04	0.5983E+03	0.8145E+07	0.4901E+10
31	1	-0.1133E+04	0.1234E+04	-0.1697E+02	0.1055E+02	-0.1688E+02	-0.1134E+04	0.6610E+030.01		0.4080E+04	0.6275E+03	0.5547E+07	0.3308E+10
32	1	-0.1444E+04	0.1404E+04	0.5715E+01	-0.5141E+02	0.7547E+01	-0.1447E+04	0.7274E+030.04		0.4316E+04	0.6562E+03	0.6207E+07	0.3762E+10
33	1	-0.1017E+04	0.1009E+04	0.9728E+01	0.3705E+01	0.9741E+01	-0.1017E+04	0.5142E+030.00		0.3519E+04	0.6606E+03	0.4366E+07	0.2583E+10
34	1	-0.9171E+03	0.2879E+04	-0.2089E+02	-0.4376E+02	-0.1876E+02	-0.9194E+03	0.4503E+030.05		0.3438E+04	0.6470E+03	0.3938E+07	0.2332E+10
35	1	-0.5811E+03	0.2811E+04	-0.7459E+01	-0.7926E+01	-0.7346E+01	-0.5814E+03	0.2870E+030.01		0.2944E+04	0.6742E+03	0.2897E+07	0.1658E+10
36	1	-0.6504E+03	0.2710E+04	-0.8710E+01	-0.4519E+02	0.1129E+02	-0.6540E+03	0.3326E+030.07		0.3084E+04	0.6891E+03	0.3171E+07	0.1844E+10
37	1	-0.3900E+03	0.2472E+04	0.7758E+01	-0.6865E+01	0.7874E+01	-0.3904E+03	0.1994E+030.02		0.2685E+04	0.6962E+03	0.2404E+07	0.1328E+10
38	1	-0.3144E+03	0.2399E+04	-0.1940E+02	-0.3800E+02	-0.1748E+02	-0.3134E+03	0.1544E+030.12		0.2579E+04	0.6901E+03	0.2215E+07	0.1208E+10
39	1	-0.9726E+02	0.2234E+04	0.4787E+01	-0.4786E+01	0.5011E+01	-0.9745E+02	0.5123E+020.05		0.2286E+04	0.7152E+03	0.1742E+07	0.8790E+09
40	1	-0.1452E+03	0.2298E+04	0.1141E+02	-0.2945E+02	0.1690E+02	-0.1507E+03	0.8379E+020.18		0.2370E+04	0.7216E+03	0.1871E+07	0.9706E+09

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

SAMPLE PROBLEM 1 EXPANSION OF A THICK WALL TUBE STEP 3 - 3 OF 4

STRAIN ELEMENT DATA

NEL	RC	ZC	ER	ET	EZ	ERZ	LR	LZ	LT	L1	L2	TL	TS	TH	EPEQ	NEL
1	1.08072	00.06669	-0.01453	0.01292	0.00030	0.00000	0.9858	1.0003	1.0132	1.0003	0.9858	0.00	-0.00	00.00	0.00705	1
2	1.14032	00.13336	-0.01130	0.00011	0.00051	0.00000	0.9870	1.0001	1.0116	1.0001	0.9870	0.00	00.00	00.00	0.00544	2
3	1.34448	00.06664	-0.00744	0.00826	-0.00034	-0.00017	0.9926	0.9997	1.0084	0.9997	0.9926	3.12	-0.00	00.00	0.00034	3
4	1.27834	00.13332	-0.00404	0.00412	0.00011	0.00037	0.9911	1.0001	1.0093	1.0001	0.9911	0.00	00.00	00.00	0.00171	4
5	1.47644	00.06664	-0.00579	0.00693	-0.00034	-0.00017	0.9943	0.9997	1.0070	0.9997	0.9943	3.11	-0.00	00.00	0.00000	5
6	1.54323	00.13328	-0.00526	0.00639	-0.00052	0.00001	0.9948	0.9995	1.0065	0.9995	0.9948	0.00	00.00	00.00	0.00000	6
7	1.74233	00.06663	-0.00392	0.00515	-0.00058	-0.00008	0.9961	0.9994	1.0052	0.9994	0.9961	3.12	-0.00	00.00	0.00000	7
8	1.67594	00.13325	-0.00426	0.00552	-0.00052	0.00007	0.9958	0.9995	1.0056	0.9995	0.9958	0.00	00.00	00.00	0.00000	8
9	1.87519	00.06663	-0.00320	0.00454	-0.00058	-0.00006	0.9968	0.9994	1.0046	0.9994	0.9968	3.11	-0.00	00.00	0.00000	9
10	1.94165	00.13326	-0.00300	0.00427	-0.00059	0.00002	0.9970	0.9994	1.0043	0.9994	0.9970	0.00	00.00	00.00	0.00000	10
11	2.14113	00.06663	-0.00231	0.00363	-0.00060	-0.00006	0.9977	0.9994	1.0037	0.9994	0.9977	3.11	-0.00	00.00	0.00000	11
12	2.07492	00.13325	-0.00248	0.00383	-0.00059	0.00002	0.9975	0.9994	1.0038	0.9994	0.9975	0.00	00.00	00.00	0.00000	12
13	2.27418	00.06663	-0.00190	0.00330	-0.00060	-0.00006	0.9981	0.9994	1.0033	0.9994	0.9981	3.10	-0.00	00.00	0.00000	13
14	2.34072	00.13325	-0.00178	0.00315	-0.00061	-0.00000	0.9982	0.9994	1.0032	0.9994	0.9982	3.14	-0.00	00.00	0.00000	14
15	2.54042	00.06662	-0.00136	0.00278	-0.00063	-0.00005	0.9986	0.9994	1.0028	0.9994	0.9986	3.07	-0.00	00.00	0.00000	15
16	2.47384	00.13325	-0.00147	0.00290	-0.00061	-0.00001	0.9985	0.9994	1.0029	0.9994	0.9985	3.13	-0.00	00.00	0.00000	16
17	2.67359	00.06662	-0.00110	0.00258	-0.00063	-0.00005	0.9989	0.9994	1.0026	0.9994	0.9989	3.04	-0.00	00.00	0.00000	17
18	2.74018	00.13325	-0.00104	0.00249	-0.00063	-0.00002	0.9990	0.9994	1.0025	0.9994	0.9990	3.10	-0.00	00.00	0.00000	18
19	2.94000	00.06663	-0.00078	0.00227	-0.00061	-0.00005	0.9992	0.9994	1.0023	0.9994	0.9992	2.88	-0.00	00.00	0.00000	19
20	2.87339	00.13325	-0.00084	0.00234	-0.00063	-0.00001	0.9992	0.9994	1.0023	0.9994	0.9992	3.11	-0.00	00.00	0.00000	20
21	1.08073	00.33341	-0.01429	0.01293	0.00024	-0.00012	0.9860	1.0002	1.0132	1.0002	0.9860	3.13	-0.00	00.00	0.00684	21
22	1.14653	00.26671	-0.01330	0.01144	0.00018	-0.00059	0.9870	1.0002	1.0116	1.0002	0.9869	3.10	-0.00	00.00	0.00547	22
23	1.34451	00.33324	-0.00744	0.00828	-0.00036	-0.00020	0.9926	0.9996	1.0084	0.9996	0.9926	3.11	-0.00	00.00	0.00035	23
24	1.27840	00.26667	-0.00905	0.00914	0.00018	-0.00072	0.9911	1.0002	1.0093	1.0002	0.9910	3.06	-0.00	00.00	0.00175	24
25	1.47646	00.33319	-0.00596	0.00695	-0.00036	0.00012	0.9941	0.9996	1.0070	0.9996	0.9941	0.00	00.00	00.00	0.00000	25
26	1.54324	00.26664	-0.00526	0.00640	-0.00056	-0.00013	0.9948	0.9994	1.0065	0.9994	0.9948	3.11	-0.00	00.00	0.00000	26
27	1.74234	00.33315	-0.00402	0.00516	-0.00053	0.00006	0.9960	0.9995	1.0052	0.9995	0.9960	0.00	00.00	00.00	0.00000	27
28	1.67594	00.26662	-0.00426	0.00552	-0.00056	-0.00007	0.9958	0.9994	1.0056	0.9994	0.9958	3.12	-0.00	00.00	0.00000	28
29	1.87519	00.33314	-0.00324	0.00453	-0.00053	0.00005	0.9967	0.9995	1.0046	0.9995	0.9967	0.00	00.00	00.00	0.00000	29
30	1.94154	00.26661	-0.00300	0.00427	-0.00058	-0.00006	0.9970	0.9994	1.0043	0.9994	0.9970	3.12	-0.00	00.00	0.00000	30
31	2.14112	00.33314	-0.00231	0.00363	-0.00059	0.00001	0.9977	0.9994	1.0036	0.9994	0.9977	0.00	00.00	00.00	0.00000	31
32	2.07491	00.26661	-0.00248	0.00382	-0.00058	-0.00007	0.9975	0.9994	1.0038	0.9994	0.9975	3.11	-0.00	00.00	0.00000	32
33	2.27417	00.33313	-0.00193	0.00329	-0.00059	0.00000	0.9981	0.9994	1.0033	0.9994	0.9981	0.00	00.00	00.00	0.00000	33
34	2.34072	00.26660	-0.00178	0.00315	-0.00061	-0.00006	0.9982	0.9994	1.0032	0.9994	0.9982	3.09	-0.00	00.00	0.00000	34
35	2.54040	00.33313	-0.00136	0.00278	-0.00062	-0.00001	0.9986	0.9994	1.0028	0.9994	0.9986	3.13	-0.00	00.00	0.00000	35
36	2.47383	00.26660	-0.00147	0.00289	-0.00061	-0.00006	0.9985	0.9994	1.0029	0.9994	0.9985	3.07	-0.00	00.00	0.00000	36
37	2.67357	00.33312	-0.00114	0.00258	-0.00062	-0.00001	0.9989	0.9994	1.0026	0.9994	0.9989	3.12	-0.00	00.00	0.00000	37
38	2.74017	00.26660	-0.00104	0.00249	-0.00064	-0.00005	0.9990	0.9994	1.0025	0.9994	0.9990	3.02	-0.00	00.00	0.00000	38
39	2.93999	00.33313	-0.00077	0.00226	-0.00064	-0.00001	0.9992	0.9994	1.0023	0.9994	0.9992	3.09	-0.00	00.00	0.00000	39
40	2.87338	00.26660	-0.00084	0.00233	-0.00064	-0.00004	0.9992	0.9994	1.0023	0.9994	0.9992	2.96	-0.00	00.00	0.00000	40

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
1	00.50641E+02	00.72540E+02	00.12322E+03	-0.74576E+03
3	00.44631E+02	00.34296E+01	00.48061E+02	00.47042E+03
5	00.31776E+02	0.E+00	00.31776E+02	00.74267E+03
7	00.16445E+02	0.E+00	00.16445E+02	00.58396E+03
9	00.12227E+02	0.E+00	00.12227E+02	00.65497E+03
11	00.74618E+01	0.E+00	00.74618E+01	00.62293E+03
13	00.59351E+01	0.E+00	00.59351E+01	00.67902E+03
15	00.40535E+01	0.E+00	00.40535E+01	00.66914E+03
17	00.34197E+01	0.E+00	00.34197E+01	00.71724E+03
19	00.25873E+01	0.E+00	00.25873E+01	00.73634E+03
21	00.50642E+02	00.70547E+02	00.12120E+03	-0.59432E+03
23	00.44563E+02	00.34747E+01	00.47982E+02	00.51416E+03
25	00.32526E+02	0.E+00	00.32526E+02	00.60216E+03
27	00.16726E+02	0.E+00	00.16726E+02	00.54683E+03
29	00.12388E+02	0.E+00	00.12388E+02	00.62527E+03
31	00.74497E+01	0.E+00	00.74497E+01	00.62745E+03
33	00.59419E+01	0.E+00	00.59419E+01	00.66001E+03
35	00.40385E+01	0.E+00	00.40385E+01	00.67419E+03
37	00.34156E+01	0.E+00	00.34156E+01	00.69616E+03
39	00.25715E+01	0.E+00	00.25715E+01	00.71521E+03

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
2	00.49922E+02	00.55774E+02	00.10570E+03	-0.11761E+04
4	00.45640E+02	00.17345E+02	00.62986E+02	00.31433E+03
6	00.26702E+02	0.E+00	00.26702E+02	00.57409E+03
8	00.19050E+02	0.E+00	00.19050E+02	00.65775E+03
10	00.10816E+02	0.E+00	00.10816E+02	00.59003E+03
12	00.83357E+01	0.E+00	00.83357E+01	00.65467E+03
14	00.53787E+01	0.E+00	00.53787E+01	00.6-066E+03
16	00.44149E+01	0.E+00	00.44149E+01	00.6-357E+03
18	00.31732E+01	0.E+00	00.31732E+01	00.69501E+03
20	00.27518E+01	0.E+00	00.27518E+01	00.72733E+03
22	00.49809E+02	00.56023E+02	00.10583E+03	-0.11053E+04
24	00.45809E+02	00.17681E+02	00.63490E+02	00.33365E+03
26	00.26742E+02	0.E+00	00.26742E+02	00.55340E+03
28	00.19071E+02	0.E+00	00.19071E+02	00.63251E+03
30	00.10810E+02	0.E+00	00.10810E+02	00.55927E+03
32	00.83312E+01	0.E+00	00.83312E+01	00.63019E+03
34	00.53731E+01	0.E+00	00.53731E+01	00.6-702E+03
36	00.44104E+01	0.E+00	00.44104E+01	00.65905E+03
38	00.31673E+01	0.E+00	00.31673E+01	00.69005E+03
40	00.27459E+01	0.E+00	00.27459E+01	00.72155E+03

THE ELASTIC ENERGY IS 00.134217E+03
THE PLASTIC ENERGY IS 00.418106E+02
THE TOTAL ENERGY IS 00.176027E+03 FOR A LOAD OF 00.219292E+05
THIS IS INCREMENT 3 - 3 OF 4
THE APPLIED LOAD IS 21929.1896 THE INC. LOAD IS 411.8105

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

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STATE MAP  STEP    4 =     1

     3   3   3   3   1   1   1   1   1   1
     1   1   1   1   1   1   1   1   1   1
     3   3   3   3   2   1   1   1   1   1
     1   1   1   1   1   1   1   1   1   1
```

TOTAL DISPLACEMENTS.

0.01775741	0.00000000	0.01421804	0.00000000	0.01232756	0.00000000	0.01097771	0.00000000	0.01007380	0.00000000
0.00933171	0.00000000	0.00879537	0.00000000	0.00835327	0.00000000	0.00803598	0.00000000	0.00777987	0.00000000
0.00759473	0.00000600	0.01775741	0.00018520	0.01453700	0.00011287	0.01224738	-.00004069	0.01103098	-.00010728
0.01004068	-.00013861	0.00934320	-.00013178	0.00876653	-.00013565	0.00835217	-.00013840	0.00800991	-.00014272
0.00776401	-.00014310	0.00757448	-.00013768	0.01775741	0.00032660	0.01432056	0.00024553	0.01243406	-.00008214
0.01102942	-.00022742	0.01008828	-.00024414	0.00931684	-.00026239	0.00877681	-.00026041	0.00832665	-.00027578
0.00800872	-.00028191	0.00774360	-.00028729	0.00756512	-.00028247				

INCREMENTAL DISPLACEMENTS

0.00275741	0.00000000	0.00206258	0.00000000	0.00165334	0.00000000	0.00145122	0.00000000	0.00132586	0.00000000
0.00122135	0.00000600	0.00114490	0.00000000	0.00108184	0.00000000	0.00103672	0.00000000	0.00100168	0.00000000
0.00097619	0.00000000	0.00275741	0.00012525	0.00214456	0.00009041	0.00183971	0.00002757	0.00146643	-.00000309
0.00132275	-.00001432	0.00122284	-.00001437	0.00113965	-.00001556	0.00106002	-.00001569	0.00100366	-.00001703
0.00099698	-.00001701	0.00097003	-.00001542	0.00275741	0.00021937	0.00211945	0.00018618	0.00170456	0.00005870
0.00148043	-.00001212	0.00133762	-.00002153	0.00122044	-.00002838	0.00114105	-.00002899	0.00107479	-.00003139
0.00102922	-.00003296	0.00094092	-.00003431	0.00096641	-.00003275				

INCREMENTAL FORCES

562.3	28.0	-0.0	110.2	0.0	-44.1	-0.0	-113.2	-0.0	10.3
-0.0	28.7	-0.0	19.1	-0.0	16.7	-0.0	6.3	-0.0	-8.7
00.0	-53.5	1177.6	00.0	00.0	0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0	00.0	00.0
0.0	-0.0	00.0	00.0	421.7	-0.0	00.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

TOTAL FORCES

5701.2	132.6	-0.0	416.1	-0.0	-329.2	-0.0	-225.8	-0.0	54.9
-0.0	66.4	-0.0	52.5	-0.0	40.2	-0.0	20.0	-0.0	-34.0
00.0	-194.1	13014.8	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	-0.0	00.0
-0.0	-0.0	00.0	00.0	5374.8	-0.0	-0.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

NODAL COORDINATES

1.017757	0.000000	1.214218	0.000000	1.412328	0.000000	1.610978	0.000000	1.810074	0.000000
2.009332	0.000000	2.208795	0.000000	2.408353	0.000000	2.608036	0.000000	2.807760	0.000000
3.007600	0.000000	1.017757	00.200185	1.214537	00.200113	1.412247	00.199959	1.611031	00.199893
1.810041	00.199869	2.009343	00.199868	2.208767	00.199864	2.408352	00.199862	2.608010	00.199857
2.807769	00.199857	3.007574	00.199862	1.017757	00.400327	1.214321	00.400246	1.412434	00.399918
1.611029	00.399773	1.810088	00.399756	2.009317	00.399738	2.208777	00.399734	2.408327	00.399724
2.608009	00.399718	2.807744	00.399713	3.007565	00.399718				

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 4 = 1 OF 4

STRESS ELEMENT DATA

NEL	IRV	SR	ST	SZ	SRZ	S1	S2	S12	TS	SIGEQ	S	J2	J3
1	3-0.8074E+04	0.4632E+04	-0.1980E+03	0.E+00	-0.1980E+03	-0.8074E+04	0.3938E+040.00	0.1111E+05	-0.1213E+04	0.4113E+08	-0.4072E+11		
2	3-0.8399E+04	0.4134E+04	-0.8412E+03	0.2777E+03	-0.8310E+03	-0.8400E+04	0.3785E+040.04	0.1093E+05	-0.1699E+04	0.3976E+08	-0.3343E+11		
3	3-0.5959E+04	0.5959E+04	-0.7809E+02	-0.1255E+03	-0.7541E+02	-0.5962E+04	0.2943E+040.02	0.1032E+05	-0.2001E+02	0.3552E+08	0.1849E+10		
4	3-0.6486E+04	0.5618E+04	0.3622E+03	0.2241E+03	0.3695E+03	-0.6469E+04	0.3419E+040.03	0.1050E+05	-0.1606E+03	0.3669E+08	-0.1903E+11		
5	1-0.4581E+04	0.6821E+04	0.4485E+03	-0.1551E+03	0.4733E+03	-0.4586E+04	0.2529E+040.03	0.9899E+04	0.9028E+03	0.3264E+08	0.1404E+11		
6	1-0.4233E+04	0.6169E+04	0.4422E+02	-0.2516E+02	0.4437E+02	-0.4233E+04	0.2139E+040.01	0.9055E+04	0.6599E+03	0.2733E+08	0.1660E+11		
7	1-0.3038E+04	0.5041E+04	-0.5003E+02	-0.6343E+02	-0.4866E+02	-0.3032E+04	0.1492E+040.02	0.7070E+04	0.6535E+03	0.1666E+08	0.1137E+11		
8	1-0.3308E+04	0.5435E+04	0.1042E+03	0.5747E+02	0.1051E+03	-0.3301E+04	0.1703E+040.02	0.7626E+04	0.7465E+03	0.1938E+08	0.1219E+11		
9	1-0.2352E+04	0.4543E+04	0.4176E+01	-0.6389E+02	0.5907E+01	-0.2354E+04	0.1180E+040.03	0.6071E+04	0.7318E+03	0.1228E+08	0.8552E+10		
10	1-0.2231E+04	0.4257E+04	-0.5120E+02	0.1991E+02	-0.5102E+02	-0.2231E+04	0.1090E+040.01	0.5716E+04	0.6563E+03	0.1090E+08	0.7375E+10		
11	1-0.1586E+04	0.3707E+04	-0.4176E+02	-0.5558E+02	-0.3978E+02	-0.1587E+04	0.7736E+030.04	0.4715E+04	0.6935E+03	0.7407E+07	0.5049E+10		
12	1-0.1717E+04	0.3902E+04	-0.3565E+01	0.1470E+02	-0.3438E+01	-0.1717E+04	0.8569E+030.01	0.4988E+04	0.7271E+03	0.8294E+07	0.5671E+10		
13	1-0.1174E+04	0.3455E+04	0.5714E+01	-0.5556E+02	0.8324E+01	-0.1177E+04	0.5926E+030.05	0.4167E+04	0.7621E+03	0.5786E+07	0.3944E+10		
14	1-0.1094E+04	0.3296E+04	-0.3173E+02	-0.7423E+01	-0.3168E+02	-0.1094E+04	0.5313E+030.01	0.3967E+04	0.7233E+03	0.5246E+07	0.3530E+10		
15	1-0.6986E+03	0.2989E+04	-0.2691E+02	-0.5021E+02	-0.2316E+02	-0.7027E+03	0.3347E+030.07	0.3403E+04	0.7543E+03	0.3857E+07	0.2535E+10		
16	1-0.7403E+03	0.3103E+04	0.4566E+01	-0.1043E+02	0.4705E+01	-0.7504E+03	0.3926E+030.01	0.3556E+04	0.7757E+03	0.4216E+07	0.2792E+10		
17	1-0.4204E+03	0.2853E+04	0.1612E+02	-0.5020E+02	0.2181E+02	-0.4261E+03	0.2239E+030.11	0.3080E+04	0.8164E+03	0.3160E+07	0.2016E+10		
18	1-0.3795E+03	0.2755E+04	-0.3046E+01	-0.2163E+02	-0.1807E+01	-0.3807E+03	0.1895E+030.06	0.2965E+04	0.7908E+03	0.2929E+07	0.1825E+10		
19	1-0.1069E+03	0.2591E+04	0.5654E+02	-0.4458E+02	0.6993E+02	-0.1202E+03	0.9507E+020.27	0.2621E+04	0.8408E+03	0.2287E+07	0.1314E+10		
20	1-0.1734E+03	0.2641E+04	0.2477E+02	-0.1045E+02	0.2532E+02	-0.1737E+03	0.9951E+020.05	0.2721E+04	0.8310E+03	0.2468E+07	0.1465E+10		
21	3-0.7701E+04	0.5027E+04	0.1325E+03	0.1304E+03	0.1303E+03	-0.7705E+04	0.3787E+040.02	0.1109E+05	-0.9360E+03	0.4100E+08	-0.3242E+11		
22	3-0.8290E+04	0.4222E+04	-0.7094E+03	-0.3387E+03	-0.6943E+03	-0.8305E+04	0.3806E+040.04	0.1093E+05	-0.1591E+04	0.3972E+08	-0.3437E+11		
23	3-0.5886E+04	0.6013E+04	-0.3146E+02	-0.2337E+03	-0.2214E+02	-0.5895E+04	0.2936E+040.04	0.1031E+05	-0.3180E+02	0.3539E+08	0.2239E+10		
24	3-0.6364E+04	0.5695E+04	0.4475E+03	-0.5276E+03	0.5378E+03	-0.6405E+04	0.3471E+040.08	0.1052E+05	-0.5733E+02	0.3659E+08	-0.2013E+11		
25	2-0.4933E+04	0.6704E+04	0.3455E+03	0.8167E+02	0.3268E+03	-0.4934E+04	0.2630E+040.02	0.1010E+05	0.7002E+03	0.3396E+08	0.1269E+11		
26	1-0.4264E+04	0.6146E+04	-0.3606E+02	-0.1311E+03	-0.3202E+02	-0.4268E+04	0.2118E+040.03	0.9071E+04	0.6155E+03	0.2741E+08	0.1754E+11		
27	1-0.3225E+04	0.5000E+04	-0.3552E+02	0.5975E+02	-0.3440E+02	-0.3227E+04	0.1598E+040.02	0.7183E+04	0.5795E+03	0.1720E+08	0.1034E+11		
28	1-0.3331E+04	0.5412E+04	0.2340E+02	-0.4788E+02	0.2408E+02	-0.3332E+04	0.1678E+040.01	0.7640E+04	0.7014E+03	0.1945E+08	0.1284E+11		
29	1-0.2501E+04	0.4507E+04	0.3419E+02	0.5675E+02	0.3546E+02	-0.2502E+04	0.1269E+040.02	0.6147E+04	0.6803E+03	0.1259E+08	0.7865E+10		
30	1-0.2227E+04	0.4257E+04	-0.4478E+02	-0.5304E+02	-0.4349E+02	-0.2230E+04	0.1093E+040.02	0.5716E+04	0.6611E+03	0.1089E+08	0.7334E+10		
31	1-0.1594E+04	0.3704E+04	-0.2244E+02	0.1207E+02	-0.2239E+02	-0.1599E+04	0.7882E+030.01	0.4716E+04	0.6941E+03	0.7414E+07	0.4945E+10		
32	1-0.1715E+04	0.3902E+04	0.2450E+01	-0.5420E+02	0.4423E+01	-0.1717E+04	0.8610E+030.03	0.4967E+04	0.7300E+03	0.8285E+07	0.5640E+10		
33	1-0.1214E+04	0.3437E+04	0.1155E+02	0.1767E+01	0.1155E+02	-0.1218E+04	0.6150E+030.00	0.4178E+04	0.7433E+03	0.5819E+07	0.3866E+10		
34	1-0.1095E+04	0.3244E+04	-0.2699E+02	-0.5447E+02	-0.2422E+02	-0.1096E+04	0.5160E+030.05	0.3964E+04	0.7244E+03	0.5235E+07	0.3510E+10		
35	1-0.6971E+03	0.2987E+04	-0.9034E+01	-0.1409E+02	-0.8745E+01	-0.6974E+03	0.3443E+030.02	0.3393E+04	0.7604E+03	0.3838E+07	0.2498E+10		
36	1-0.7794E+03	0.3101E+04	0.9421E+01	-0.5746E+02	0.1359E+02	-0.7835E+03	0.3986E+030.07	0.3554E+04	0.7710E+03	0.4206E+07	0.2775E+10		
37	1-0.4754E+03	0.2827E+04	0.9354E+01	-0.1263E+02	0.9883E+01	-0.4757E+03	0.2427E+030.03	0.3089E+04	0.7870E+03	0.3180E+07	0.2003E+10		
38	1-0.3451E+03	0.2746E+04	-0.1287E+02	-0.4904E+02	-0.6366E+01	-0.3910E+03	0.1926E+030.13	0.2964E+04	0.7827E+03	0.2926E+07	0.1824E+10		
39	1-0.1209E+03	0.2564E+04	0.8766E+01	-0.8763E+01	0.9355E+01	-0.1215E+03	0.6541E+020.07	0.2623E+04	0.8173E+03	0.2291E+07	0.1525E+10		
40	1-0.1787E+03	0.2633E+04	0.1506E+02	-0.3846E+02	0.2241E+02	-0.1861E+03	0.1042E+030.19	0.2720E+04	0.8230E+03	0.2465E+07	0.1465E+10		

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE — STEP 4 - 1 OF 4

STRAIN ELEMENT DATA

NEL	RC	ZC	ER	ET	EZ	ERZ	LR	LZ	LT	L1	L2	TL	TS	TR	EPEQ	NEL
1	1.08324	00.06673	-0.01818	0.01519	0.00092	0.00000	0.9823	1.0009	1.0155	1.0009	0.9823	0.00	-0.00	00.00	0.01039	1
2	1.14884	00.13343	-0.01650	0.01340	0.00056	0.00084	0.9839	1.0006	1.0137	1.0006	0.9839	0.00	00.00	00.00	0.00833	2
3	1.34626	00.06665	-0.00959	0.00956	-0.00020	-0.00020	0.9905	0.9998	1.0097	0.9998	0.9905	3.12	-0.00	00.00	0.00225	3
4	1.28033	00.13336	-0.01165	0.01062	0.00056	0.00043	0.9886	1.0006	1.0108	1.0006	0.9886	0.00	00.00	00.00	0.00413	4
5	1.47852	00.06665	-0.00682	0.00798	-0.00020	-0.00020	0.9933	0.9998	1.0081	0.9998	0.9932	3.11	-0.00	00.00	0.00000	5
6	1.54475	00.13324	-0.00614	0.00736	-0.00054	-0.00003	0.9939	0.9995	1.0074	0.9995	0.9939	3.14	-0.00	00.00	0.00000	6
7	1.74370	00.06662	-0.00455	0.00593	-0.00065	-0.00008	0.9955	0.9993	1.0060	0.9993	0.9955	3.12	-0.00	00.00	0.00000	7
8	1.67735	00.13325	-0.00494	0.00635	-0.00054	0.00008	0.9950	0.9995	1.0064	0.9995	0.9950	0.00	00.00	00.00	0.00000	8
9	1.87648	00.06662	-0.00373	0.00522	-0.00065	-0.00008	0.9963	0.9993	1.0053	0.9993	0.9963	3.11	-0.00	00.00	0.00000	9
10	1.94241	00.13325	-0.00351	0.00491	-0.00066	0.00003	0.9965	0.9993	1.0050	0.9993	0.9965	0.00	00.00	00.00	0.00000	10
11	2.14230	00.06662	-0.00269	0.00418	-0.00068	-0.00007	0.9973	0.9993	1.0042	0.9993	0.9973	3.11	-0.00	00.00	0.00000	11
12	2.07541	00.13324	-0.00290	0.00440	-0.00066	0.00002	0.9971	0.9993	1.0044	0.9993	0.9971	0.00	00.00	00.00	0.00000	12
13	2.27531	00.06662	-0.00222	0.00379	-0.00068	-0.00007	0.9978	0.9993	1.0038	0.9993	0.9978	3.09	-0.00	00.00	0.00000	13
14	2.34142	00.13324	-0.00208	0.00362	-0.00069	-0.00001	0.9979	0.9993	1.0036	0.9993	0.9979	3.13	-0.00	00.00	0.00000	14
15	2.54147	00.06662	-0.00154	0.00320	-0.00071	-0.00007	0.9984	0.9993	1.0032	0.9993	0.9984	3.07	-0.00	00.00	0.00000	15
16	2.47491	00.13324	-0.00172	0.00332	-0.00069	-0.00001	0.9983	0.9993	1.0033	0.9993	0.9983	3.13	-0.00	00.00	0.00000	16
17	2.67481	00.06662	-0.00128	0.00296	-0.00071	-0.00007	0.9987	0.9993	1.0030	0.9993	0.9987	3.03	-0.00	00.00	0.00000	17
18	2.74119	00.13324	-0.00121	0.00286	-0.00072	-0.00003	0.9988	0.9993	1.0029	0.9993	0.9988	3.08	-0.00	00.00	0.00000	18
19	2.94098	00.06662	-0.00090	0.00260	-0.00069	-0.00006	0.9991	0.9993	1.0026	0.9993	0.9991	2.87	-0.00	00.00	0.00000	19
20	2.87437	00.13324	-0.00097	0.00268	-0.00072	-0.00001	0.9990	0.9993	1.0027	0.9993	0.9990	3.09	-0.00	00.00	0.00000	20
21	1.08328	00.33359	-0.01764	0.01522	0.00071	-0.00021	0.9828	1.0007	1.0156	1.0007	0.9828	3.13	-0.00	00.00	0.00993	21
22	1.14847	00.26685	-0.01650	0.01343	0.00066	-0.00074	0.9839	1.0007	1.0137	1.0007	0.9839	3.10	-0.00	00.00	0.00837	22
23	1.34633	00.33337	-0.00957	0.00961	-0.00021	-0.00035	0.9906	0.9998	1.0098	0.9998	0.9906	3.10	-0.00	00.00	0.00231	23
24	1.28037	00.26677	-0.01165	0.01064	0.00066	-0.00094	0.9886	1.0007	1.0106	1.0007	0.9885	3.07	-0.00	00.00	0.00419	24
25	1.47857	00.33322	-0.00710	0.00802	-0.00021	0.00011	0.9930	0.9998	1.0081	0.9998	0.9930	0.00	00.00	00.00	0.00000	25
26	1.54477	00.26654	-0.00614	0.00738	-0.00060	-0.00017	0.9939	0.9994	1.0075	0.9994	0.9939	3.11	-0.00	00.00	0.00000	26
27	1.74372	00.33313	-0.00474	0.00594	-0.00057	0.00008	0.9953	0.9994	1.0060	0.9994	0.9953	0.00	00.00	00.00	0.00000	27
28	1.67737	00.26651	-0.00499	0.00636	-0.00060	-0.00006	0.9950	0.9994	1.0064	0.9994	0.9950	3.13	-0.00	00.00	0.00000	28
29	1.87648	00.33312	-0.00388	0.00522	-0.00057	0.00007	0.9961	0.9994	1.0053	0.9994	0.9961	0.00	00.00	00.00	0.00000	29
30	1.94290	00.26649	-0.00351	0.00491	-0.00065	-0.00007	0.9965	0.9993	1.0049	0.9993	0.9965	3.12	-0.00	00.00	0.00000	30
31	2.14229	00.33311	-0.00271	0.00417	-0.00065	0.00002	0.9973	0.9993	1.0042	0.9993	0.9973	0.00	00.00	00.00	0.00000	31
32	2.07581	00.26649	-0.00290	0.00439	-0.00065	-0.00008	0.9971	0.9993	1.0044	0.9993	0.9971	3.11	-0.00	00.00	0.00000	32
33	2.27529	00.33311	-0.00226	0.00378	-0.00065	0.00000	0.9977	0.9993	1.0038	0.9993	0.9977	0.00	00.00	00.00	0.00000	33
34	2.34142	00.26648	-0.00208	0.00362	-0.00069	-0.00007	0.9979	0.9993	1.0036	0.9993	0.9979	3.09	-0.00	00.00	0.00000	34
35	2.54145	00.33310	-0.00154	0.00319	-0.00070	-0.00002	0.9984	0.9993	1.0032	0.9993	0.9984	3.12	-0.00	00.00	0.00000	35
36	2.47490	00.26648	-0.00172	0.00332	-0.00069	-0.00007	0.9983	0.9993	1.0033	0.9993	0.9983	3.07	-0.00	00.00	0.00000	36
37	2.67459	00.33310	-0.00133	0.00296	-0.00070	-0.00002	0.9987	0.9993	1.0030	0.9993	0.9987	3.12	-0.00	00.00	0.00000	37
38	2.74117	00.26648	-0.00121	0.00286	-0.00072	-0.00006	0.9988	0.9993	1.0029	0.9993	0.9988	3.01	-0.00	00.00	0.00000	38
39	2.94096	00.33310	-0.00089	0.00259	-0.00072	-0.00001	0.9991	0.9993	1.0026	0.9993	0.9991	3.07	-0.00	00.00	0.00000	39
40	2.87436	00.26648	-0.00097	0.00267	-0.00072	-0.00005	0.9990	0.9993	1.0027	0.9993	0.9990	2.95	-0.00	00.00	0.00000	40

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.	ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
1	00.54354E+02	00.10854E+03	00.16289E+03	-0.12133E+04	2	00.53525E+02	00.86534E+02	00.14006E+03	-0.10992E+04
3	00.46142E+02	00.22794E+02	00.68936E+02	-0.26010E+02	4	00.47772E+02	00.42163E+02	00.89935E+02	-0.10057E+03
5	00.42953E+02	0.E+00	00.42953E+02	00.90284E+03	6	00.35794E+02	0.E+00	00.35794E+02	00.65993E+03
7	00.21918E+02	0.E+00	00.21918E+02	00.65353E+03	8	00.25537E+02	0.E+00	00.25537E+02	00.74654E+03
9	00.16293E+02	0.E+00	00.16293E+02	00.73184E+03	10	00.14429E+02	0.E+00	00.14429E+02	00.85834E+03
11	00.99218E+01	0.E+00	00.99218E+01	00.69347E+03	12	00.11100E+02	0.E+00	00.11100E+02	00.72714E+03
13	00.78744E+01	0.E+00	00.78744E+01	00.76207E+03	14	00.71335E+01	0.E+00	00.71335E+01	00.72326E+03
15	00.53589E+01	0.E+00	00.53589E+01	00.75426E+03	16	00.58414E+01	0.E+00	00.58414E+01	00.77571E+03
17	00.45110E+01	0.E+00	00.45110E+01	00.81641E+03	18	00.41835E+01	0.E+00	00.41835E+01	00.79084E+03
19	00.34070E+01	0.E+00	00.34070E+01	00.84880E+03	20	00.36226E+01	0.E+00	00.36226E+01	00.83101E+03
21	00.53847E+02	00.10396E+03	00.15780E+03	-0.93597E+03	22	00.53311E+02	00.86925E+02	00.14024E+03	-0.15926E+04
23	00.45044E+02	00.23352E+02	00.69446E+02	00.31604E+02	24	00.47925E+02	00.42801E+02	00.90726E+02	-0.57329E+02
25	00.44481E+02	0.E+00	00.44481E+02	00.70017E+03	26	00.35884E+02	0.E+00	00.35884E+02	00.61551E+03
27	00.22561E+02	0.E+00	00.22561E+02	00.57956E+03	28	00.25587E+02	0.E+00	00.25587E+02	00.70143E+03
29	00.16651E+02	0.E+00	00.16651E+02	00.66028E+03	30	00.14421E+02	0.E+00	00.14421E+02	00.80110E+03
31	00.99274E+01	0.E+00	00.99274E+01	00.69412E+03	32	00.11095E+02	0.E+00	00.11095E+02	00.73054E+03
33	00.78961E+01	0.E+00	00.78961E+01	00.74329E+03	34	00.71247E+01	0.E+00	00.71247E+01	00.72441E+03
35	00.53367E+01	0.E+00	00.53367E+01	00.76043E+03	36	00.58345E+01	0.E+00	00.58345E+01	00.77701E+03
37	00.45058E+01	0.E+00	00.45058E+01	00.78699E+03	38	00.41740E+01	0.E+00	00.41740E+01	00.79265E+03
39	00.33613E+01	0.E+00	00.33613E+01	00.81732E+03	40	00.36134E+01	0.E+00	00.36134E+01	00.82300E+03

THE ELASTIC ENERGY IS 00.163290E+03
THE PLASTIC ENERGY IS 00.743541E+02
THE TOTAL ENERGY IS 00.237645E+03 FOR A LOAD OF 00.240909E+05
THIS IS INCREMENT 4 - 1 OF 4
THE APPLIED LOAD IS 24090.8534 THE INC. LOAD IS 2161.6638

SCALED STEP

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

STATE MAP STEP 4 - 2

```
     3   3   3   3   2   1   1   1   1   1
     1   1   1   1   1   1   1   1   1   1
     3   3   3   3   3   1   1   1   1   1
     1   1   1   1   1   1   1   1   1   1
```

TOTAL DISPLACEMENTS

0.01816314	0.00000000	0.01451628	0.00000000	0.01256559	0.00000000	0.01118614	0.00000000	0.01026351	0.00000000
0.00950583	0.00000000	0.00895820	0.00000000	0.00850642	0.00000000	0.00816298	0.00000000	0.00792171	0.00000000
0.00773798	0.00000000	0.01816314	0.00021118	0.01485148	0.00013061	0.01248443	-.00003606	0.01124134	-.00010792
0.01022975	-.00013214	0.00945742	-.00013349	0.00892646	-.00013761	0.00850541	-.00014053	0.00815598	-.00014507
0.00791019	-.00014566	0.00771176	-.00013978	0.01816314	0.00036687	0.01483691	0.00028179	0.01269133	-.00007021
0.01123771	-.00022971	0.01027764	-.00024711	0.00949010	-.00026575	0.00893879	-.00027020	0.00847906	-.00028000
0.00815452	-.00028644	0.00788383	-.00029205	0.00770181	-.00028699				

INCREMENTAL DISPLACEMENTS

0.00040572	0.00000000	0.00029822	0.00000000	0.00023803	0.00000000	0.00020843	0.00000000	0.00018971	0.00000000
0.00017412	0.00000000	0.00016283	0.00000000	0.00015355	0.00000000	0.00014649	0.00000000	0.00014184	0.00000000
0.00013825	0.00000000	0.00040572	0.00002598	0.00031448	0.00001774	0.00026705	0.00000403	0.00021035	-.00000064
0.00018407	-.00000153	0.00017422	-.00000171	0.00016194	-.00000196	0.00015324	-.00000213	0.00014687	-.00000235
0.00014117	-.00000238	0.00013768	-.00000211	0.00040572	0.00000028	0.00031634	0.00000626	0.00025727	0.00001193
0.00020829	-.00000229	0.00018936	-.00000297	0.00017326	-.00000337	0.00016199	-.00000379	0.00015241	-.00000422
0.00014580	-.00000453	0.00014023	-.00000476	0.00013669	-.00000452				

INCREMENTAL FORCES

80.0	-3.1	-0.0	7.6	-0.0	5.8	-0.0	-4.2	-0.0	-1.5
-0.0	2.1	-0.0	1.0	-0.0	1.6	-0.0	00.7	-0.0	-1.5
00.0	-4.5	154.0	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	00.0	00.0
-0.0	-0.0	00.0	00.0	45.8	-0.0	-0.0	-0.0	00.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

TOTAL FORCES

5781.3	129.5	-0.0	423.7	-0.0	-323.4	-0.0	-230.0	-0.0	53.4
-0.0	64.5	-0.0	53.5	-0.0	41.9	-0.0	20.7	-0.0	-35.5
00.0	-202.7	13168.8	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	-0.0	00.0
-0.0	-0.0	00.0	00.0	5420.6	-0.0	-0.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

NODAL COORDINATES

1.018163	0.000000	1.214516	0.000000	1.412566	0.000000	1.611186	0.000000	1.810264	0.000000
2.009506	0.000000	2.208959	0.000000	2.408507	0.000000	2.608183	0.000000	2.807922	0.000000
3.007734	0.000000	1.016163	00.200211	1.214851	00.200131	1.412484	00.199963	1.611241	00.199842
1.810230	00.199468	2.009517	00.199867	2.208928	00.199862	2.408505	00.199859	2.608156	00.199855
2.807910	00.199855	3.007712	00.199860	1.018163	00.400367	1.214837	00.400282	1.412691	00.399930
1.611238	00.399770	1.810278	00.399753	2.009490	00.399734	2.208939	00.399730	2.408479	00.399720
2.608155	00.399714	2.807884	00.399708	3.007702	00.399713				

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 4 - 2 OF 4

STRESS ELEMENT DATA

NEL	IRV	SR	ST	SZ	SRZ	S1	S2	S12	TS	SIGEQ	S	J2	J3
1	3	-0.8191E+04	0.4555E+04	-0.1934E+03	0.E+00	-0.1934E+03	-0.8191E+04	0.3999E+04	0.00	0.1116E+05	-0.1277E+04	0.4150E+08	-0.4366E+11
2	3	-0.8500E+04	0.4001E+04	-0.4563E+03	0.2814E+03	-0.8459E+03	-0.8511E+04	0.3432E+04	0.04	0.1097E+05	-0.1765E+04	0.4006E+08	-0.3567E+11
3	3	-0.6075E+04	0.5874E+04	-0.1143E+03	-0.1238E+03	-0.1117E+03	-0.6075E+04	0.2981E+04	0.02	0.1035E+05	-0.1026E+04	0.3570E+08	0.4076E+09
4	3	-0.6588E+04	0.5530E+04	0.3642E+03	0.2213E+03	0.3713E+03	-0.6587E+04	0.3479E+04	0.03	0.1053E+05	-0.2265E+04	0.3692E+08	-0.2186E+11
5	2	-0.4681E+04	0.6994E+04	0.4986E+03	-0.1570E+03	0.5033E+03	-0.4666E+04	0.2594E+04	0.03	0.1010E+05	0.9234E+03	0.3399E+08	0.1437E+11
6	1	-0.4334E+04	0.4280E+04	0.4410E+02	-0.3040E+02	0.4431E+02	-0.4334E+04	0.2189E+04	0.01	0.9239E+04	0.6633E+03	0.2845E+08	0.1736E+11
7	1	-0.3097E+04	0.5134E+04	-0.4985E+02	-0.6516E+02	-0.4846E+02	-0.3098E+04	0.1525E+04	0.02	0.7208E+04	0.6023E+03	0.1731E+08	0.1197E+11
8	1	-0.3376E+04	0.5534E+04	0.1079E+03	0.5997E+02	0.1089E+03	-0.3377E+04	0.1743E+04	0.02	0.7778E+04	0.7554E+03	0.2016E+08	0.1276E+11
9	1	-0.2460E+04	0.4626E+04	0.5386E+01	-0.6512E+02	0.7144E+01	-0.2407E+04	0.1207E+04	0.03	0.6189E+04	0.7421E+03	0.1276E+08	0.9004E+10
10	1	-0.2283E+04	0.4333E+04	-0.5251E+02	0.1975E+02	-0.5234E+02	-0.2283E+04	0.1115E+04	0.01	0.5830E+04	0.6054E+03	0.1133E+08	0.7766E+10
11	1	-0.1626E+04	0.3773E+04	-0.4265E+02	-0.5731E+02	-0.4077E+02	-0.1624E+04	0.7917E+03	0.04	0.4806E+04	0.7029E+03	0.7695E+07	0.5522E+10
12	1	-0.1754E+04	0.3972E+04	-0.3321E+01	0.1440E+02	-0.3203E+01	-0.1758E+04	0.8773E+03	0.01	0.5085E+04	0.7370E+03	0.8619E+07	0.5974E+10
13	1	-0.1202E+04	0.3517E+04	0.6120E+01	-0.5729E+02	0.8830E+01	-0.1205E+04	0.6068E+03	0.05	0.4247E+04	0.7735E+03	0.6008E+07	0.4159E+10
14	1	-0.1121E+04	0.3364E+04	-0.3273E+02	-0.8394E+01	-0.3266E+02	-0.1121E+04	0.5440E+03	0.01	0.4042E+04	0.7337E+03	0.5447E+07	0.3724E+10
15	1	-0.7161E+03	0.3042E+04	-0.2786E+02	-0.5199E+02	-0.2396E+02	-0.7200E+03	0.3480E+03	0.07	0.3467E+04	0.7659E+03	0.4003E+07	0.2677E+10
16	1	-0.7995E+03	0.3198E+04	0.4707E+01	-0.1145E+02	0.4870E+01	-0.7997E+03	0.4023E+03	0.01	0.3623E+04	0.7078E+03	0.4376E+07	0.2946E+10
17	1	-0.4300E+03	0.2905E+04	0.1669E+02	-0.5147E+02	0.2265E+02	-0.4366E+03	0.2296E+03	0.11	0.3137E+04	0.8303E+03	0.3278E+07	0.2128E+10
18	1	-0.3692E+03	0.2804E+04	-0.2977E+01	-0.2244E+02	-0.1619E+01	-0.3906E+03	0.1945E+03	0.06	0.3019E+04	0.8040E+03	0.3038E+07	0.1926E+10
19	1	-0.1094E+03	0.2634E+04	0.5933E+02	-0.5045E+02	0.7324E+02	-0.1237E+03	0.9447E+02	0.27	0.2669E+04	0.8625E+03	0.2371E+07	0.1386E+10
20	1	-0.1786E+03	0.2689E+04	0.2578E+02	-0.1126E+02	0.2640E+02	-0.1787E+03	0.1025E+03	0.06	0.2771E+04	0.8458E+03	0.2559E+07	0.1547E+10
21	3	-0.7775E+04	0.5006E+04	-0.1346E+03	0.1323E+03	-0.1323E+03	-0.7772E+04	0.3820E+04	0.02	0.1114E+05	-0.9966E+03	0.4132E+08	-0.3379E+11
22	3	-0.8393E+04	0.4197E+04	-0.7174E+03	0.3343E+03	-0.7031E+03	-0.8408E+04	0.3852E+04	0.04	0.1097E+05	-0.1651E+04	0.4003E+08	-0.3656E+11
23	3	-0.5973E+04	0.5997E+04	-0.3231E+02	-0.2344E+03	-0.2308E+02	-0.5942E+04	0.2980E+04	0.04	0.1034E+05	-0.1024E+02	0.3556E+08	0.5716E+09
24	3	-0.6474E+04	0.5614E+04	0.5059E+03	-0.5310E+03	0.5460E+03	-0.6515E+04	0.3530E+04	0.05	0.1055E+05	-0.1184E+04	0.3682E+08	-0.2274E+11
25	3	-0.5014E+04	0.6696E+04	0.3370E+03	0.9161E+02	0.3386E+03	-0.5016E+04	0.2677E+04	0.02	0.1012E+05	0.6597E+03	0.3413E+08	0.1098E+11
26	1	-0.4366E+04	0.4295E+04	-0.4305E+02	-0.1441E+03	-0.3826E+02	-0.4373E+04	0.2167E+04	0.03	0.9255E+04	0.6146E+03	0.2853E+08	0.1648E+11
27	1	-0.3293E+04	0.5092E+04	-0.3533E+02	0.5900E+02	-0.3427E+02	-0.3294E+04	0.1630E+04	0.02	0.7322E+04	0.5474E+03	0.1787E+08	0.1089E+11
28	1	-0.3410E+04	0.4508E+04	0.2027E+02	-0.5359E+02	0.2111E+02	-0.3411E+04	0.1716E+04	0.02	0.7792E+04	0.7001E+03	0.2023E+08	0.1355E+11
29	1	-0.2557E+04	0.4584E+04	0.3449E+02	0.5653E+02	0.3572E+02	-0.2558E+04	0.1297E+04	0.02	0.6266E+04	0.6388E+03	0.1309E+08	0.8268E+10
30	1	-0.2281E+04	0.4331E+04	-0.4588E+02	-0.5526E+02	-0.4456E+02	-0.2282E+04	0.1114E+04	0.02	0.5828E+04	0.6559E+03	0.1132E+08	0.7723E+10
31	1	-0.1636E+04	0.3770E+04	-0.2281E+02	0.1137E+02	-0.2273E+02	-0.1636E+04	0.8064E+03	0.01	0.4806E+04	0.7033E+03	0.7700E+07	0.5212E+10
32	1	-0.1756E+04	0.3972E+04	0.3426E+01	-0.6054E+02	0.5510E+01	-0.1758E+04	0.8816E+03	0.03	0.5083E+04	0.7405E+03	0.8609E+07	0.5941E+10
33	1	-0.1244E+04	0.3498E+04	0.1179E+02	0.1041E+01	0.1179E+02	-0.1244E+04	0.6299E+03	0.00	0.4258E+04	0.7334E+03	0.6043E+07	0.4076E+10
34	1	-0.1129E+04	0.4342E+04	-0.2782E+02	-0.5634E+02	-0.2492E+02	-0.1123E+04	0.5459E+03	0.05	0.4039E+04	0.7144E+03	0.5436E+07	0.3702E+10
35	1	-0.7144E+03	0.4041E+04	-0.9218E+01	-0.1570E+02	-0.8885E+01	-0.7147E+03	0.3529E+03	0.02	0.3457E+04	0.7721E+03	0.3983E+07	0.2639E+10
36	1	-0.7986E+03	0.4196E+04	0.9733E+01	-0.5947E+02	0.1408E+02	-0.8030E+03	0.4085E+03	0.07	0.3620E+04	0.7491E+03	0.4366E+07	0.2929E+10
37	1	-0.4882E+03	0.2877E+04	0.9614E+01	-0.1359E+02	0.9985E+01	-0.4886E+03	0.2493E+03	0.03	0.3146E+04	0.7995E+03	0.3299E+07	0.2113E+10
38	1	-0.3991E+03	0.2795E+04	-0.1324E+02	-0.5147E+02	-0.6427E+01	-0.4019E+03	0.1947E+03	0.13	0.3019E+04	0.7955E+03	0.3035E+07	0.1925E+10
39	1	-0.1245E+03	0.2610E+04	0.9422E+01	-0.9419E+01	0.1004E+02	-0.1252E+03	0.6764E+02	0.07	0.2670E+04	0.8317E+03	0.2377E+07	0.1394E+10
40	1	-0.1434E+03	0.2680E+04	0.1564E+02	-0.3974E+02	0.2324E+02	-0.1415E+03	0.1074E+03	0.19	0.2770E+04	0.8372E+03	0.2556E+07	0.1546E+10

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 4 - 2 OF 4

STRAIN ELEMENT DATA

NEL	RC	ZC	ER	ET	EZ	ERZ	LR	LZ	LT	L1	L2	TL	TS	TR	EPEQ	NEL
1	1.08361	00.06674	-0.01875	0.01552	0.00105	0.00000	0.9818	1.0011	1.0159	1.0011	0.9818	0.00	-0.00	00.00	0.01088	1
2	1.14918	00.13345	-0.01898	0.01369	0.00065	0.00000	0.9834	1.0007	1.0140	1.0007	0.9834	0.00	00.00	00.00	0.00875	2
3	1.34652	00.06665	-0.00990	0.00975	-0.00018	-0.00021	0.9902	0.9998	1.0099	0.9998	0.9902	3.12	-0.00	00.00	0.00252	3
4	1.28002	00.13336	-0.01204	0.01083	0.00065	0.00043	0.9882	1.0007	1.0110	1.0007	0.9882	0.00	00.00	00.00	0.00447	4
5	1.47875	00.06665	-0.00697	0.00813	-0.00018	-0.00021	0.9931	0.9998	1.0082	0.9998	0.9931	3.11	-0.00	00.00	0.00000	5
6	1.54447	00.13329	-0.00627	0.00750	-0.00054	-0.00004	0.9938	0.9995	1.0076	0.9995	0.9938	3.13	-0.00	00.00	0.00000	6
7	1.74369	00.06662	-0.00485	0.00604	-0.00066	-0.00009	0.9954	0.9993	1.0061	0.9993	0.9954	3.12	-0.00	00.00	0.00000	7
8	1.67755	00.13325	-0.00510	0.00647	-0.00054	0.00008	0.9949	0.9995	1.0065	0.9995	0.9949	0.00	00.00	00.00	0.00000	8
9	1.87667	00.06662	-0.00381	0.00531	-0.00066	-0.00009	0.9962	0.9993	1.0054	0.9993	0.9962	3.11	-0.00	00.00	0.00000	9
10	1.94308	00.13324	-0.00354	0.00501	-0.00067	0.00003	0.9964	0.9993	1.0050	0.9993	0.9964	0.00	00.00	00.00	0.00000	10
11	2.14245	00.06662	-0.00275	0.00425	-0.00069	-0.00007	0.9973	0.9993	1.0043	0.9993	0.9973	3.11	-0.00	00.00	0.00000	11
12	2.07548	00.13324	-0.00296	0.00448	-0.00067	0.00002	0.9971	0.9993	1.0045	0.9993	0.9971	0.00	00.00	00.00	0.00000	12
13	2.27548	00.06662	-0.00226	0.00380	-0.00069	-0.00007	0.9977	0.9993	1.0039	0.9993	0.9977	3.09	-0.00	00.00	0.00000	13
14	2.34148	00.13324	-0.00212	0.00369	-0.00070	-0.00001	0.9979	0.9993	1.0037	0.9993	0.9979	3.13	-0.00	00.00	0.00000	14
15	2.54162	00.06662	-0.00182	0.00325	-0.00073	-0.00007	0.9984	0.9993	1.0033	0.9993	0.9984	3.07	-0.00	00.00	0.00000	15
16	2.47516	00.13324	-0.00175	0.00330	-0.00070	-0.00001	0.9983	0.9993	1.0034	0.9993	0.9983	3.13	-0.00	00.00	0.00000	16
17	2.67745	00.06662	-0.00131	0.00302	-0.00073	-0.00007	0.9987	0.9993	1.0030	0.9993	0.9987	3.03	-0.00	00.00	0.00000	17
18	2.74133	00.13324	-0.00123	0.00291	-0.00073	-0.00003	0.9988	0.9993	1.0029	0.9993	0.9988	3.08	-0.00	00.00	0.00000	18
19	2.94112	00.06662	-0.00092	0.00265	-0.00070	-0.00007	0.9991	0.9993	1.0027	0.9993	0.9991	2.87	-0.00	00.00	0.00000	19
20	2.87451	00.13324	-0.00094	0.00273	-0.00073	-0.00001	0.9990	0.9993	1.0027	0.9993	0.9990	3.09	-0.00	00.00	0.00000	20
21	1.08365	00.33362	-0.01811	0.01555	0.00078	-0.00022	0.9824	1.0008	1.0159	1.0008	0.9824	3.13	-0.00	00.00	0.01037	21
22	1.14962	00.26687	-0.01698	0.01373	0.00075	-0.00076	0.9834	1.0008	1.0140	1.0008	0.9834	3.10	-0.00	00.00	0.00879	22
23	1.34660	00.33339	-0.00987	0.00981	-0.00017	-0.00036	0.9903	0.9998	1.0100	0.9998	0.9903	3.10	-0.00	00.00	0.00258	23
24	1.28006	00.26679	-0.01205	0.01087	0.00075	-0.00097	0.9882	1.0008	1.0110	1.0008	0.9881	3.07	-0.00	00.00	0.00453	24
25	1.47860	00.33322	-0.00735	0.00817	-0.00017	0.00012	0.9927	0.9998	1.0083	0.9998	0.9927	0.00	00.00	00.00	0.00022	25
26	1.54449	00.26654	-0.00627	0.00751	-0.00061	-0.00019	0.9938	0.9994	1.0076	0.9994	0.9938	3.11	-0.00	00.00	0.00000	26
27	1.74342	00.33313	-0.00484	0.00605	-0.00058	0.00008	0.9952	0.9994	1.0061	0.9994	0.9952	0.00	00.00	00.00	0.00000	27
28	1.67757	00.26651	-0.00510	0.00648	-0.00061	-0.00007	0.9949	0.9994	1.0065	0.9994	0.9949	3.13	-0.00	00.00	0.00000	28
29	1.87667	00.33312	-0.00396	0.00531	-0.00058	0.00007	0.9961	0.9994	1.0054	0.9994	0.9961	0.00	00.00	00.00	0.00000	29
30	1.94308	00.26649	-0.00358	0.00500	-0.00066	-0.00007	0.9964	0.9993	1.0050	0.9993	0.9964	3.12	-0.00	00.00	0.00000	30
31	2.14245	00.33311	-0.00277	0.00425	-0.00066	0.00001	0.9972	0.9993	1.0043	0.9993	0.9972	0.00	00.00	00.00	0.00000	31
32	2.07548	00.26649	-0.00296	0.00448	-0.00066	-0.00008	0.9971	0.9993	1.0045	0.9993	0.9971	3.11	-0.00	00.00	0.00000	32
33	2.27545	00.33310	-0.00231	0.00385	-0.00066	0.00000	0.9977	0.9993	1.0039	0.9993	0.9977	0.00	00.00	00.00	0.00000	33
34	2.34147	00.26648	-0.00212	0.00368	-0.00070	-0.00007	0.9979	0.9993	1.0037	0.9993	0.9979	3.09	-0.00	00.00	0.00000	34
35	2.54160	00.33310	-0.00163	0.00325	-0.00071	-0.00002	0.9984	0.9993	1.0033	0.9993	0.9984	3.12	-0.00	00.00	0.00000	35
36	2.47515	00.26648	-0.00175	0.00338	-0.00070	-0.00008	0.9983	0.9993	1.0034	0.9993	0.9982	3.07	-0.00	00.00	0.00000	36
37	2.67743	00.33309	-0.00136	0.00301	-0.00071	-0.00002	0.9986	0.9993	1.0030	0.9993	0.9986	3.11	-0.00	00.00	0.00000	37
38	2.74132	00.26647	-0.00123	0.00291	-0.00073	-0.00007	0.9988	0.9993	1.0029	0.9993	0.9988	3.01	-0.00	00.00	0.00000	38
39	2.94110	00.33309	-0.00091	0.00264	-0.00074	-0.00001	0.9991	0.9993	1.0026	0.9993	0.9991	3.07	-0.00	00.00	0.00000	39
40	2.87450	00.26647	-0.00099	0.00272	-0.00073	-0.00005	0.9990	0.9993	1.0027	0.9993	0.9990	2.95	-0.00	00.00	0.00000	40

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.	ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
1	00.54922E+02	00.11400E+03	00.16892E+03	-0.12767E+04	2	00.54057E+02	00.91082E+02	00.14514E+03	-0.17654E+04
3	00.46435E+02	00.25526E+02	00.71961E+02	-0.10284E+03	4	00.48095E+02	00.45708E+02	00.93804E+02	-0.22853E+03
5	00.44715E+02	0.E+00	00.44715E+02	00.92365E+03	6	00.37250E+02	0.E+00	00.37250E+02	00.65329E+03
7	00.22777E+02	0.E+00	00.22777E+02	00.66232E+03	8	00.26556E+02	0.E+00	00.26556E+02	00.75544E+03
9	00.16930E+02	0.E+00	00.16930E+02	00.74211E+03	10	00.14994E+02	0.E+00	00.14994E+02	00.65594E+03
11	00.10304E+02	0.E+00	00.10304E+02	00.70281E+03	12	00.11530E+02	0.E+00	00.11530E+02	00.73699E+03
13	00.81741E+01	0.E+00	00.81741E+01	00.77354E+03	14	00.74040E+01	0.E+00	00.74040E+01	00.73369E+03
15	00.55594E+01	0.E+00	00.55594E+01	00.76593E+03	16	00.60607E+01	0.E+00	00.60607E+01	00.75775E+03
17	00.46780E+01	0.E+00	00.46780E+01	00.83026E+03	18	00.43381E+01	0.E+00	00.43381E+01	00.80404E+03
19	00.35323E+01	0.E+00	00.35323E+01	00.86249E+03	20	00.37559E+01	0.E+00	00.37559E+01	00.84554E+03
21	00.54294E+02	00.10476E+03	00.16105E+03	-0.96619E+03	22	00.53823E+02	00.91504E+02	00.14533E+03	-0.16513E+04
23	00.46323E+02	00.26117E+02	00.72440E+02	-0.16244E+02	24	00.48243E+02	00.46399E+02	00.94642E+02	-0.11934E+03
25	00.44636E+02	00.21754E+01	00.46411E+02	00.65969E+03	26	00.37346E+02	0.E+00	00.37346E+02	00.61469E+03
27	00.23438E+02	0.E+00	00.23438E+02	00.58779E+03	28	00.26608E+02	0.E+00	00.26608E+02	00.73608E+03
29	00.17300E+02	0.E+00	00.17300E+02	00.68865E+03	30	00.14985E+02	0.E+00	00.14985E+02	00.65877E+03
31	00.10306E+02	0.E+00	00.10306E+02	00.70384E+03	32	00.11524E+02	0.E+00	00.11524E+02	00.73996E+03
33	00.81971E+01	0.E+00	00.81971E+01	00.75382E+03	34	00.73946E+01	0.E+00	00.73946E+01	00.73483E+03
35	00.55359E+01	0.E+00	00.55359E+01	00.77231E+03	36	00.60534E+01	0.E+00	00.60534E+01	00.75905E+03
37	00.46728E+01	0.E+00	00.46728E+01	00.79950E+03	38	00.43280E+01	0.E+00	00.43280E+01	00.79549E+03
39	00.35048E+01	0.E+00	00.35048E+01	00.83167E+03	40	00.37459E+01	0.E+00	00.37459E+01	00.83721E+03

THE ELASTIC ENERGY IS 00.167480E+03
THE PLASTIC ENERGY IS 00.794765E+02
THE TOTAL ENERGY IS 00.246956E+03FOR A LOAD OF 00.243707E+05
THIS IS INCREMENT 4 - 2 OF 4
THE APPLIED LOAD IS 24370.7071THE INC. LOAD IS 279.8538

SCALED STEP

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

STATE MAP STEP 4 - 3

3 3 3 3 3 2 1 1 1 1
1 1 1 1 1 1 1 1 1 1
3 3 3 3 3 2 1 1 1 1
1 1 1 1 1 1 1 1 1 1

TOTAL DISPLACEMENTS

0.01996290	0.00000000	0.01586090	0.00000000	0.01365618	0.00000000	0.01208390	0.00000000	0.01104845	0.00000000
0.01026846	0.00000000	0.00467110	0.00000000	0.00917974	0.00000000	0.00882723	0.00000000	0.00854340	0.00000000
0.00834393	0.00000000	0.01996290	0.00031732	0.01625096	0.00020932	0.01353981	-.00000968	0.01210911	-.00010699
0.01103953	-.00014120	0.01028148	-.00014158	0.00963652	-.00014691	0.00917718	-.00015002	0.00879627	-.00015543
0.00852840	-.00015578	0.00831340	-.00014897	0.01996290	0.00054019	0.01603794	0.00044306	0.01383151	-.00000878
0.01215969	-.00023277	0.01111275	-.00026015	0.01025127	-.00028133	0.00964949	-.00028723	0.00914723	-.00029868
0.00879356	-.00030633	0.00849833	-.00031289	0.00830080	-.00030671				

INCREMENTAL DISPLACEMENTS

0.00179977	0.00000000	0.00134462	0.00000000	0.00104059	0.00000000	0.00089776	0.00000000	0.00082495	0.00000000
0.00076103	0.00000000	0.00071290	0.00000000	0.00067292	0.00000000	0.00064426	0.00000000	0.00062169	0.00000000
0.00060595	0.00000000	0.00179977	0.00010615	0.00139948	0.00007871	0.00105538	0.00002698	0.00092777	0.00000092
0.00082978	-.00000406	0.00076406	-.00000810	0.00071006	-.00000930	0.00067177	-.00000949	0.00064029	-.00001036
0.00061872	-.00001032	0.00066164	-.00000919	0.00179977	0.00017332	0.00140104	0.00016127	0.00114018	0.00006142
0.00092198	-.00000306	0.00083511	-.00001305	0.00076117	-.00001557	0.00071070	-.00001703	0.00066817	-.00001868
0.00063904	-.00001989	0.00061450	-.00002084	0.00059898	-.00001972				

INCREMENTAL FORCES

299.9	-12.5	-0.0	86.5	-0.0	-1.7	-0.0	-81.9	-0.0	-12.8
-0.0	37.5	-0.0	9.9	-0.0	14.1	-0.0	4.4	-0.0	-5.6
00.0	-38.0	640.0	00.0	-0.0	00.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	-0.0	00.0	-0.0	-0.0	-0.0	00.0
00.0	-0.0	00.0	00.0	210.7	-0.0	-0.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	00.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

TOTAL FORCES

6081.1	117.0	-0.0	510.2	-0.0	-325.1	-0.0	-311.9	-0.0	40.6
-0.0	106.0	-0.0	63.5	-0.0	55.9	-0.0	25.1	-0.0	-41.2
00.0	-240.7	13808.8	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	-0.0	00.0
-0.0	-0.0	00.0	00.0	5631.3	-0.0	-0.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

NODAL COORDINATES

1.019963	0.000000	1.215861	0.000000	1.413656	0.000000	1.612084	0.000000	1.811088	0.000000
2.010267	0.000000	2.209671	0.000000	2.409180	0.000000	2.608827	0.000000	2.808543	0.000000
3.008344	0.000000	1.019963	00.200317	1.216251	00.200209	1.413540	00.199990	1.612169	00.199893
1.811060	00.199859	2.010281	00.199858	2.209639	00.199853	2.409177	00.199850	2.608796	00.199845
2.808529	00.199844	3.008313	00.199851	1.019963	00.400540	1.216038	00.400443	1.413832	00.399991
1.612160	00.399767	1.811113	00.399740	2.010251	00.399719	2.209649	00.399713	2.409147	00.399701
2.608794	00.399694	2.808498	00.399687	3.008301	00.399693				

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 4 - 3 OF 4

STRESS ELEMENT DATA

NEL	IRV	SR	ST	SZ	SRZ	S1	S2	S12	TS	SIGEQ	S	J2	J3
1	3	-0.8626E+04	0.4304E+04	-0.1749E+03	0.E+00	-0.1749E+03	-0.8626E+04	0.4226E+04	0.00	0.1137E+05	-0.1499E+04	0.4311E+08	-0.3476E+11
2	3	-0.8959E+04	0.3769E+04	-0.9149E+03	0.2821E+03	-0.9050E+03	-0.8969E+04	0.4032E+04	0.00	0.1116E+05	-0.2035E+04	0.4144E+08	-0.3501E+11
3	3	-0.6462E+04	0.5617E+04	-0.1727E+03	-0.1755E+03	-0.1677E+03	-0.6467E+04	0.3150E+04	0.03	0.1047E+05	-0.3392E+03	0.3650E+08	-0.3074E+10
4	3	-0.7097E+04	0.5147E+04	0.3639E+03	0.1932E+03	0.3689E+03	-0.7097E+04	0.3733E+04	0.03	0.1069E+05	-0.5270E+03	0.3805E+08	-0.3319E+11
5	3	-0.4957E+04	0.6796E+04	0.5582E+03	-0.2047E+03	0.5661E+03	-0.4965E+04	0.2766E+04	0.04	0.1019E+05	0.7990E+03	0.3455E+08	0.3813E+10
6	2	-0.4837E+04	0.4749E+04	0.3862E+02	-0.2239E+02	0.3872E+02	-0.4837E+04	0.2438E+04	0.00	0.1008E+05	0.6502E+03	0.3384E+08	0.2046E+11
7	1	-0.3334E+04	0.5553E+04	-0.4038E+02	-0.5544E+02	-0.3943E+02	-0.3335E+04	0.1648E+04	0.02	0.7782E+04	0.7203E+03	0.2018E+08	0.1503E+11
8	1	-0.3731E+04	0.5963E+04	0.1344E+03	0.9883E+02	0.1369E+03	-0.3734E+04	0.1935E+04	0.03	0.8455E+04	0.7886E+03	0.2382E+08	0.1530E+11
9	1	-0.2615E+04	0.4992E+04	0.6851E+01	-0.5540E+02	0.8034E+01	-0.2616E+04	0.1312E+04	0.02	0.6694E+04	0.7946E+03	0.1493E+08	0.1127E+11
10	1	-0.2517E+04	0.4663E+04	-0.6423E+02	0.2747E+02	-0.6393E+02	-0.2517E+04	0.1227E+04	0.01	0.6321E+04	0.6940E+03	0.1332E+08	0.7864E+10
11	1	-0.1774E+04	0.4065E+04	-0.4869E+02	-0.6281E+02	-0.4641E+02	-0.1780E+04	0.8668E+03	0.04	0.5199E+04	0.7461E+03	0.9007E+07	0.5657E+10
12	1	-0.1943E+04	0.4275E+04	-0.7050E+01	0.1794E+02	-0.6883E+01	-0.1939E+04	0.9659E+03	0.01	0.5509E+04	0.7766E+03	0.1011E+08	0.7445E+10
13	1	-0.1322E+04	0.3787E+04	0.4978E+01	-0.6276E+02	0.7943E+01	-0.1325E+04	0.6662E+03	0.05	0.4593E+04	0.8236E+03	0.7026E+07	0.3205E+10
14	1	-0.1234E+04	0.3610E+04	-0.3681E+02	-0.1092E+02	-0.3651E+02	-0.1236E+04	0.5996E+03	0.01	0.4373E+04	0.7779E+03	0.6375E+07	0.4661E+10
15	1	-0.7911E+03	0.3275E+04	-0.3237E+02	-0.5944E+02	-0.2771E+02	-0.7958E+03	0.3440E+03	0.08	0.3746E+04	0.8170E+03	0.4674E+07	0.3357E+10
16	1	-0.6455E+03	0.3403E+04	0.4034E+01	-0.1535E+02	0.4298E+01	-0.6853E+03	0.4448E+03	0.02	0.3917E+04	0.8395E+03	0.5113E+07	0.3689E+10
17	1	-0.4755E+03	0.3123E+04	0.1476E+02	-0.5943E+02	0.2585E+02	-0.4826E+03	0.2542E+03	0.12	0.3387E+04	0.8909E+03	0.3813E+07	0.2668E+10
18	1	-0.4324E+03	0.3020E+04	-0.2454E+01	-0.2458E+02	-0.9603E+00	-0.4343E+03	0.2167E+03	0.07	0.3259E+04	0.8616E+03	0.3540E+07	0.2414E+10
19	1	-0.1224E+03	0.2845E+04	0.7158E+02	-0.5476E+02	0.8797E+02	-0.1392E+03	0.1136E+03	0.27	0.2877E+04	0.9313E+03	0.2756E+07	0.1734E+10
20	1	-0.1997E+03	0.2897E+04	0.3016E+02	-0.1441E+02	0.3111E+02	-0.2007E+03	0.1159E+03	0.06	0.2989E+04	0.9093E+03	0.2976E+07	0.1938E+10
21	3	-0.4064E+04	0.4490E+04	-0.1320E+03	-0.1292E+03	-0.1299E+03	-0.8066E+04	0.3968E+04	0.02	0.1133E+05	-0.1096E+04	0.4277E+08	-0.4033E+11
22	3	-0.4423E+04	0.3895E+04	-0.7472E+03	-0.3223E+03	-0.7343E+03	-0.8836E+04	0.4051E+04	0.04	0.1116E+05	-0.1892E+04	0.4142E+08	-0.4591E+11
23	3	-0.6354E+04	0.5714E+04	-0.4324E+02	-0.2311E+03	-0.3478E+02	-0.6361E+04	0.3163E+04	0.04	0.1046E+05	-0.2273E+03	0.3642E+08	-0.3699E+10
24	3	-0.6654E+04	0.5257E+04	0.5330E+03	-0.5411E+03	0.5719E+03	-0.6997E+04	0.3744E+04	0.07	0.1071E+05	-0.3694E+03	0.3794E+08	-0.3421E+11
25	3	-0.5376E+04	0.6421E+04	0.3756E+03	0.1224E+03	0.3782E+03	-0.5379E+04	0.2878E+04	0.02	0.1022E+05	0.4736E+03	0.3480E+08	0.3408E+10
26	2	-0.4882E+04	0.6716E+04	-0.7865E+02	-0.2054E+03	-0.6994E+02	-0.4891E+04	0.2410E+04	0.04	0.1010E+05	0.5853E+03	0.3396E+08	0.2226E+11
27	1	-0.3607E+04	0.5494E+04	-0.2872E+02	0.5011E+02	-0.2802E+02	-0.3607E+04	0.1790E+04	0.01	0.7942E+04	0.6195E+03	0.2102E+08	0.1335E+11
28	1	-0.3777E+04	0.5929E+04	0.1653E+02	-0.8349E+02	0.1743E+02	-0.3779E+04	0.1899E+04	0.02	0.8474E+04	0.7228E+03	0.2393E+08	0.1655E+11
29	1	-0.2463E+04	0.4943E+04	0.4210E+02	0.6154E+02	0.4344E+02	-0.2821E+04	0.1432E+04	0.02	0.6800E+04	0.7219E+03	0.1541E+08	0.1016E+11
30	1	-0.2511E+04	0.4665E+04	0.5339E+02	-0.5903E+02	-0.5194E+02	-0.2515E+04	0.1231E+04	0.02	0.6319E+04	0.6995E+03	0.1331E+08	0.7591E+10
31	1	-0.1401E+04	0.4059E+04	-0.2497E+02	0.9748E+01	-0.2492E+02	-0.1403E+04	0.8869E+03	0.01	0.5205E+04	0.7437E+03	0.9031E+07	0.6488E+10
32	1	-0.1935E+04	0.4277E+04	0.3885E+01	-0.6851E+02	0.6304E+01	-0.1937E+04	0.9717E+03	0.04	0.5506E+04	0.7822E+03	0.1010E+08	0.7391E+10
33	1	-0.1381E+04	0.3764E+04	0.1139E+02	-0.9031E+00	0.1139E+02	-0.1381E+04	0.6970E+03	0.00	0.4609E+04	0.7990E+03	0.7081E+07	0.5076E+10
34	1	-0.1234E+04	0.3604E+04	-0.3208E+02	-0.6344E+02	-0.2873E+02	-0.1240E+04	0.6054E+03	0.05	0.4370E+04	0.7798E+03	0.6369E+07	0.4629E+10
35	1	-0.7904E+03	0.3273E+04	-0.1015E+02	-0.1992E+02	-0.9646E+01	-0.7914E+03	0.3909E+03	0.03	0.3735E+04	0.8239E+03	0.4650E+07	0.3298E+10
36	1	-0.8836E+03	0.3794E+04	0.1070E+02	-0.6809E+02	0.1586E+02	-0.8887E+03	0.4523E+03	0.08	0.3913E+04	0.8416E+03	0.5100E+07	0.3664E+10
37	1	-0.5459E+03	0.3094E+04	0.1079E+02	-0.1763E+02	0.1132E+02	-0.5459E+03	0.2744E+03	0.03	0.3398E+04	0.8541E+03	0.3848E+07	0.2646E+10
38	1	-0.4194E+03	0.3004E+04	-0.1498E+02	-0.5953E+02	-0.6770E+01	-0.4476E+03	0.2204E+03	0.14	0.3258E+04	0.8515E+03	0.3536E+07	0.2413E+10
39	1	-0.1404E+03	0.2812E+04	0.1234E+02	-0.1247E+02	0.1337E+02	-0.1414E+03	0.7757E+02	0.08	0.2879E+04	0.8945E+03	0.2763E+07	0.1751E+10
40	1	-0.2065E+03	0.2887E+04	0.1420E+02	-0.4575E+02	0.2716E+02	-0.2155E+03	0.1213E+03	0.19	0.2988E+04	0.8994E+03	0.2974E+07	0.1937E+10

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 4 - 3 OF 4

STRAIN ELEMENT DATA

NEL	RC	ZC	ER	ET	EZ	ERZ	LR	LZ	LT	L1	L2	TL	TS	TR	EPEQ	NEL
1	1.08526	00.06677	-0.02116	0.01699	0.00158	0.00000	0.9795	1.0016	1.0174	1.0016	0.9795	0.00	-0.00	00.00	0.01303	1
2	1.15069	00.13351	-0.01909	0.01497	0.00104	0.00074	0.9814	1.0010	1.0153	1.0010	0.9814	0.00	00.00	00.00	0.01061	2
3	1.34769	00.06666	-0.01121	0.01059	-0.00005	-0.00030	0.9890	1.0000	1.0108	1.0000	0.9890	3.11	-0.00	00.00	0.00370	3
4	1.28158	00.13340	-0.01383	0.01180	0.00105	0.00045	0.9864	1.0010	1.0120	1.0010	0.9864	0.00	00.00	00.00	0.00605	4
5	1.47976	00.06666	-0.00796	0.00881	-0.00005	-0.00030	0.9921	1.0000	1.0089	1.0000	0.9921	3.10	-0.00	00.00	0.00091	5
6	1.54543	00.13329	-0.00642	0.00812	-0.00054	-0.00003	0.9931	0.9995	1.0082	0.9995	0.9931	3.14	-0.00	00.00	0.00000	6
7	1.74474	00.06662	-0.00501	0.00652	-0.00071	-0.00007	0.9950	0.9993	1.0066	0.9993	0.9950	3.12	-0.00	00.00	0.00000	7
8	1.67844	00.13325	-0.00559	0.00699	-0.00054	0.00013	0.9945	0.9995	1.0071	0.9995	0.9945	0.00	00.00	00.00	0.00000	8
9	1.87747	00.06662	-0.00413	0.00574	-0.00071	-0.00037	0.9959	0.9993	1.0058	0.9993	0.9959	3.12	-0.00	00.00	0.00000	9
10	1.94367	00.13324	-0.00391	0.00541	-0.00071	0.00004	0.9961	0.9993	1.0054	0.9993	0.9961	0.00	00.00	00.00	0.00000	10
11	2.14319	00.06662	-0.00299	0.00459	-0.00074	-0.00036	0.9970	0.9993	1.0046	0.9993	0.9970	3.11	-0.00	00.00	0.00000	11
12	2.07673	00.13324	-0.00323	0.00483	-0.00071	0.00002	0.9968	0.9993	1.0049	0.9993	0.9968	0.00	00.00	00.00	0.00000	12
13	2.27616	00.06662	-0.00247	0.00416	-0.00074	-0.00008	0.9975	0.9993	1.0042	0.9993	0.9975	3.09	-0.00	00.00	0.00000	13
14	2.34267	00.13323	-0.00231	0.00398	-0.00075	-0.00001	0.9977	0.9992	1.0040	0.9993	0.9977	3.13	-0.00	00.00	0.00000	14
15	2.54227	00.06661	-0.00177	0.00351	-0.00078	-0.00008	0.9982	0.9992	1.0035	0.9992	0.9982	3.06	-0.00	00.00	0.00000	15
16	2.47572	00.13323	-0.00191	0.00365	-0.00075	-0.00002	0.9981	0.9992	1.0037	0.9993	0.9981	3.12	-0.00	00.00	0.00000	16
17	2.67539	00.06661	-0.00142	0.00325	-0.00078	-0.00008	0.9986	0.9992	1.0033	0.9992	0.9986	3.02	-0.00	00.00	0.00000	17
18	2.74196	00.13323	-0.00138	0.00314	-0.00078	-0.00004	0.9987	0.9992	1.0032	0.9992	0.9987	3.08	-0.00	00.00	0.00000	18
19	2.94173	00.06662	-0.00100	0.00285	-0.00075	-0.00008	0.9990	0.9993	1.0029	0.9993	0.9990	2.87	-0.00	00.00	0.00000	19
20	2.87513	00.13323	-0.00108	0.00294	-0.00078	-0.00002	0.9989	0.9992	1.0030	0.9992	0.9989	3.08	-0.00	00.00	0.00000	20
21	1.08532	00.33377	-0.02022	0.01704	0.00111	-0.00025	0.9804	1.0011	1.0175	1.0011	0.9804	3.13	-0.00	00.00	0.01231	21
22	1.15075	00.26699	-0.01909	0.01502	0.00117	-0.00083	0.9814	1.0012	1.0154	1.0012	0.9814	3.10	-0.00	00.00	0.01067	22
23	1.34750	00.33347	-0.01122	0.01068	0.00001	-0.00040	0.9890	1.0000	1.0109	1.0000	0.9890	3.11	-0.00	00.00	0.00379	23
24	1.28194	00.26668	-0.01384	0.01185	0.00116	-0.00110	0.9864	1.0012	1.0121	1.0012	0.9864	3.07	-0.00	00.00	0.00612	24
25	1.47984	00.33325	-0.00846	0.00886	0.00001	0.00018	0.9916	1.0000	1.0090	1.0000	0.9916	0.00	00.00	00.00	0.00122	25
26	1.54546	00.26655	-0.00692	0.00813	-0.00063	-0.00027	0.9931	0.9994	1.0082	0.9994	0.9931	3.10	-0.00	00.00	0.00000	26
27	1.74478	00.33312	-0.00528	0.00654	-0.00060	0.00007	0.9948	0.9994	1.0066	0.9994	0.9948	0.00	00.00	00.00	0.00000	27
28	1.67846	00.26651	-0.00559	0.00700	-0.00063	-0.00011	0.9945	0.9994	1.0071	0.9994	0.9944	3.12	-0.00	00.00	0.00000	28
29	1.87747	00.33311	-0.00434	0.00574	-0.00060	0.00008	0.9957	0.9994	1.0058	0.9994	0.9957	0.00	00.00	00.00	0.00000	29
30	1.94346	00.26648	-0.00391	0.00540	-0.00070	-0.00004	0.9961	0.9993	1.0054	0.9993	0.9961	3.12	-0.00	00.00	0.00000	30
31	2.14313	00.33309	-0.00302	0.00458	-0.00070	0.00001	0.9970	0.9993	1.0046	0.9993	0.9970	0.00	00.00	00.00	0.00000	31
32	2.07672	00.26648	-0.00323	0.00483	-0.00070	-0.00009	0.9968	0.9993	1.0049	0.9993	0.9968	3.11	-0.00	00.00	0.00000	32
33	2.27615	00.33304	-0.00252	0.00416	-0.00070	-0.00000	0.9975	0.9993	1.0042	0.9993	0.9975	3.14	-0.00	00.00	0.00000	33
34	2.34265	00.26647	-0.00231	0.00397	-0.00074	-0.00008	0.9977	0.9993	1.0040	0.9993	0.9977	3.09	-0.00	00.00	0.00000	34
35	2.54225	00.33308	-0.00177	0.00350	-0.00076	-0.00003	0.9982	0.9992	1.0035	0.9992	0.9982	3.12	-0.00	00.00	0.00000	35
36	2.47571	00.26647	-0.00191	0.00364	-0.00074	-0.00009	0.9981	0.9993	1.0037	0.9993	0.9981	3.07	-0.00	00.00	0.00000	36
37	2.67536	00.33308	-0.00148	0.00325	-0.00076	-0.00002	0.9985	0.9992	1.0033	0.9992	0.9985	3.11	-0.00	00.00	0.00000	37
38	2.74194	00.26646	-0.00134	0.00313	-0.00079	-0.00008	0.9987	0.9992	1.0031	0.9992	0.9987	3.00	-0.00	00.00	0.00000	38
39	2.94170	00.33308	-0.00099	0.00284	-0.00079	-0.00002	0.9990	0.9992	1.0029	0.9992	0.9990	3.06	-0.00	00.00	0.00000	39
40	2.87511	00.26646	-0.00198	0.00293	-0.00079	-0.00006	0.9989	0.9992	1.0029	0.9992	0.9989	2.95	-0.00	00.00	0.00000	40

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.	ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
1	00.57392E+02	00.13830E+03	00.19539E+03	-0.14991E+04	2	00.56461E+02	00.11156E+03	00.16803E+03	-0.20350E+04
3	00.47562E+02	00.37742E+02	00.85303E+02	-0.33920E+03	4	00.49679E+02	00.62299E+02	00.11198E+03	-0.52704E+03
5	00.45339E+02	00.92245E+01	00.54613E+02	00.79901E+03	6	00.44243E+02	0.E+00	00.44243E+02	00.65013E+03
7	00.26561E+02	0.E+00	00.26561E+02	00.72635E+03	8	00.31348E+02	0.E+00	00.31348E+02	00.78865E+03
9	00.19797E+02	0.E+00	00.19797E+02	00.79457E+03	10	00.17605E+02	0.E+00	00.17605E+02	00.65402E+03
11	00.12048E+02	0.E+00	00.12048E+02	00.74810E+03	12	00.13511E+02	0.E+00	00.13511E+02	00.77662E+03
13	00.95488E+01	0.E+00	00.95488E+01	00.82362E+03	14	00.86504E+01	0.E+00	00.86504E+01	00.77794E+03
15	00.64810E+01	0.E+00	00.64810E+01	00.81704E+03	16	00.70700E+01	0.E+00	00.70700E+01	00.83954E+03
17	00.54462E+01	0.E+00	00.54462E+01	00.89089E+03	18	00.50489E+01	0.E+00	00.50489E+01	00.86160E+03
19	00.41040E+01	0.E+00	00.41040E+01	00.93128E+03	20	00.43674E+01	0.E+00	00.43674E+01	00.90429E+03
21	00.56345E+02	00.13034E+03	00.18669E+03	-0.10959E+04	22	00.56133E+02	00.11210E+03	00.16823E+03	-0.15917E+04
23	00.47449E+02	00.34690E+02	00.81140E+02	-0.22732E+03	24	00.49740E+02	00.63179E+02	00.11291E+03	-0.35939E+03
25	00.45345E+02	00.12341E+02	00.57736E+02	00.47357E+03	26	00.44410E+02	0.E+00	00.44410E+02	00.55531E+03
27	00.27560E+02	0.E+00	00.27560E+02	00.61951E+03	28	00.31427E+02	0.E+00	00.31427E+02	00.72281E+03
29	00.20352E+02	0.E+00	00.20352E+02	00.72180E+03	30	00.17596E+02	0.E+00	00.17596E+02	00.69946E+03
31	00.12073E+02	0.E+00	00.12073E+02	00.74366E+03	32	00.13506E+02	0.E+00	00.13506E+02	00.75219E+03
33	00.95879E+01	0.E+00	00.95879E+01	00.79902E+03	34	00.86385E+01	0.E+00	00.86385E+01	00.77786E+03
35	00.64526E+01	0.E+00	00.64526E+01	00.82388E+03	36	00.70609E+01	0.E+00	00.70609E+01	00.84158E+03
37	00.54409E+01	0.E+00	00.54409E+01	00.85407E+03	38	00.50360E+01	0.E+00	00.50360E+01	00.85150E+03
39	00.40723E+01	0.E+00	00.40723E+01	00.89449E+03	40	00.43545E+01	0.E+00	00.43545E+01	00.89940E+03

THE ELASTIC ENERGY IS 00.145552E+03
THE PLASTIC ENERGY IS 00.104429E+03
THE TOTAL ENERGY IS 00.249981E+03 FOR A LOAD OF 00.255212E+05
THIS IS INCREMENT 4 - 3 OF 4
THE APPLIED LOAD IS 25521.2346 THE INC. LOAD IS 1150.5275

SCALED STEP

TABLE VIII. - Continued. SAMPLE PROBLEM (4) - OUTPUT

STATE MAP STEP 4 - 4

3	3	3	3	3	3	1	1	1	1
1	1	1	1	1	1	1	1	1	1
3	3	3	3	3	3	1	1	1	1
1	1	1	1	1	1	1	1	1	1

TOTAL DISPLACEMENTS

0.02000000	0.00000000	0.01588884	0.00000000	0.01367886	0.00000000	0.01210218	0.00000000	0.01110511	0.00000000
0.01028215	0.00000000	0.00968541	0.00000000	0.00919324	0.00000000	0.00884016	0.00000000	0.00855586	0.00000000
0.00385804	0.00000000	0.00200000	0.00031951	0.01624015	0.00021092	0.01356226	-.00030901	0.01213770	-.00010681
0.01107615	-.00014131	0.01029681	-.00014174	0.00965277	-.00014710	0.00919065	-.00015021	0.00880910	-.00015564
0.00454130	-.00015549	0.00432545	-.00014915	0.02000000	0.00054372	0.01606704	0.00044629	0.01385515	-.00000726
0.01217847	-.00023245	0.01112967	-.00020028	0.01026661	-.00028104	0.00966378	-.00028756	0.00916064	-.00029905
0.00480638	-.00030672	0.00451064	-.00031330	0.00831279	-.00030710				

INCREMENTAL DISPLACEMENTS

0.00003710	0.00000000	0.00002794	0.00000000	0.00002268	0.00000000	0.00001828	0.00000000	0.00001666	0.00000000
0.00001529	0.00000000	0.00001431	0.00000000	0.00001350	0.00000000	0.00001292	0.00000000	0.00001247	0.00000000
0.00001215	0.00000000	0.00003713	0.00000219	0.00002919	0.00000160	0.00002245	0.00000067	0.00001860	0.00000018
0.00001662	-.00000011	0.00001533	-.00000016	0.00001425	-.00000019	0.00001348	-.00000019	0.00001284	-.00000021
0.00001240	-.00000020	0.00001205	-.00000018	0.00003710	0.00000353	0.00002910	0.00000343	0.00002364	0.00000151
0.00001878	0.00000032	0.00001693	-.00000013	0.00001534	-.00000032	0.00001429	-.00000033	0.00001341	-.00000037
0.00001281	-.00000039	0.00001231	-.00000041	0.00001200	-.00000039				

INCREMENTAL FORCES

5.3	-0.1	-0.0	00.6	00.0	00.2	-0.0	-0.2	-0.0	-0.6
-0.0	00.2	-0.0	00.3	-0.0	00.3	-0.0	00.1	-0.0	-0.1
00.0	-0.8	10.8	00.0	-0.0	-0.0	-0.0	00.0	-0.0	-0.0
0.0	00.0	00.0	-0.0	00.0	00.0	-0.0	-0.0	-0.0	00.0
-0.0	-0.0	00.0	00.0	3.6	-0.0	-0.0	-0.0	00.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	00.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

TOTAL FORCES

6086.4	117.0	-0.0	510.7	-0.0	-324.9	-0.0	-312.1	-0.0	40.0
-0.0	106.3	-0.0	63.8	-0.0	56.2	-0.0	25.2	-0.0	-41.3
00.0	-241.5	13819.7	00.0	-0.0	-0.0	-0.0	00.0	00.0	-0.0
00.0	00.0	-0.0	-0.0	00.0	00.0	-0.0	-0.0	-0.0	00.0
-0.0	-0.0	00.0	00.0	5634.9	-0.0	-0.0	-0.0	-0.0	-0.0
00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	-0.0	00.0	00.0
00.0	-0.0	00.0	00.0	00.0	00.0				

NODAL COORDINATES

1.020000	0.000000	1.215889	0.000000	1.413679	0.000000	1.612102	0.000000	1.811105	0.000000
2.010282	0.000000	2.209685	0.000000	2.409193	0.000000	2.608840	0.000000	2.808556	0.000000
3.008356	0.000000	1.020000	00.200320	1.216280	00.200211	1.413562	00.199991	1.612168	00.199893
1.811076	00.199859	2.010297	00.199858	2.209653	00.199853	2.409191	00.199850	2.608809	00.199844
2.808541	00.199844	3.008325	00.199851	1.020000	00.400544	1.216067	00.400446	1.413855	00.399993
1.612178	00.399768	1.811130	00.399740	2.010267	00.399718	2.209664	00.399712	2.409161	00.399701
2.608805	00.399693	2.608511	00.399687	3.008313	00.399693				

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 4 - 4 OF 4

STRESS ELEMENT DATA

NEL	IRV	SR	ST	SZ	SRZ	S1	S2	S12	TS	SIGEQ	S	J2	J3
1	3-0.8634E+04	0.4300E+04	-0.1748E+03	0.E+00	-0.1748E+03	-0.8634E+04	0.4229E+040.00	0.1138E+05	-0.150JE+04	0.4314E+08	-0.5495E+11		
2	3-0.8966E+04	0.3765E+04	-0.9159E+03	0.2824E+03	-0.9060E+03	-0.8976E+04	0.4035E+040.04	0.1116E+05	-0.2039E+04	0.4147E+08	-0.4516E+11		
3	3-0.6475E+04	0.5613E+04	-0.1735E+03	0.1765E+03	-0.1685E+03	-0.6475E+04	0.3153E+040.03	0.1047E+05	-0.3435E+03	0.3652E+08	-0.6203E+10		
4	3-0.7101E+04	0.5142E+04	-0.3641E+03	0.1932E+03	-0.3691E+03	-0.7106E+04	0.3737E+040.03	0.1069E+05	-0.5316E+03	0.3807E+08	-0.3338E+11		
5	3-0.4964E+04	0.6791E+04	0.5567E+03	-0.2097E+03	0.5666E+03	-0.4972E+04	0.2769E+040.04	0.1019E+05	0.7952E+03	0.3459E+08	0.8169E+10		
6	3-0.4845E+04	0.6744E+04	0.3718E+02	-0.2264E+02	0.3729E+02	-0.4845E+04	0.2441E+040.00	0.1004E+05	0.6454E+03	0.3365E+08	0.2036E+11		
7	1-0.3339E+04	0.5561E+04	-0.4014E+02	0.5591E+02	-0.3919E+02	-0.3340E+04	0.1651E+040.02	0.7794E+04	0.7273E+03	0.2025E+08	0.1309E+11		
8	1-0.3738E+04	0.5972E+04	0.1360E+03	0.9869E+02	0.1385E+03	-0.3741E+04	0.1940E+040.03	0.8468E+04	0.7900E+03	0.2369E+08	0.1535E+11		
9	1-0.2625E+04	0.4999E+04	0.7151E+01	-0.5587E+02	0.8339E+01	-0.2621E+04	0.1315E+040.02	0.6704E+04	0.7956E+03	0.1498E+08	0.1132E+11		
10	1-0.2521E+04	0.4670E+04	-0.6434E+02	0.2746E+02	-0.6404E+02	-0.2522E+04	0.1229E+040.01	0.6331E+04	0.6947E+03	0.1336E+08	0.9704E+10		
11	1-0.1781E+04	0.4070E+04	-0.4886E+02	0.6293E+02	-0.4657E+02	-0.1783E+04	0.8683E+030.04	0.5207E+04	0.7469E+03	0.9035E+07	0.6666E+10		
12	1-0.1942E+04	0.4282E+04	-0.7070E+01	0.1795E+02	-0.6903E+01	-0.1942E+04	0.9677E+030.01	0.5517E+04	0.7775E+03	0.1015E+08	0.7476E+10		
13	1-0.1324E+04	0.3793E+04	0.4918E+01	-0.6240E+02	0.7888E+01	-0.1327E+04	0.6674E+030.03	0.4600E+04	0.6246E+03	0.7050E+07	0.5228E+10		
14	1-0.1249E+04	0.3615E+04	-0.3674E+02	-0.1048E+02	-0.3864E+02	-0.1240E+04	0.6007E+030.01	0.4380E+04	0.7788E+03	0.6394E+07	0.4661E+10		
15	1-0.7927E+03	0.3279E+04	-0.3248E+02	0.5941E+02	-0.2780E+02	-0.7974E+03	0.3846E+030.08	0.3752E+04	0.8180E+03	0.4688E+07	0.3372E+10		
16	1-0.8867E+03	0.3404E+04	0.4032E+01	-0.1543E+02	0.4269E+01	-0.8870E+03	0.4456E+030.02	0.3922E+04	0.8406E+03	0.5128E+07	0.3705E+10		
17	1-0.4765E+03	0.3134E+04	0.1379E+02	-0.5979E+02	0.2590E+02	-0.4836E+03	0.2547E+030.12	0.3392E+04	0.8421E+03	0.3831E+07	0.2679E+10		
18	1-0.4333E+03	0.3024E+04	-0.2854E+01	-0.2870E+02	-0.9480E+00	-0.4352E+03	0.2171E+030.07	0.3264E+04	0.8627E+03	0.3551E+07	0.2425E+10		
19	1-0.1235E+03	0.2849E+04	0.7185E+02	-0.5894E+02	0.8828E+02	-0.1395E+03	0.1139E+030.27	0.2882E+04	0.9327E+03	0.2764E+07	0.1742E+10		
20	1-0.2006E+03	0.2902E+04	0.3025E+02	-0.1449E+02	0.3121E+02	-0.2011E+03	0.1162E+030.06	0.2993E+04	0.9106E+03	0.2986E+07	0.1947E+10		
21	3-0.4069E+04	0.4908E+04	-0.1321E+03	-0.1293E+03	-0.1300E+03	-0.8071E+04	0.3971E+040.02	0.1133E+05	-0.1096E+04	0.4280E+08	-0.4044E+11		
22	3-0.8436E+04	0.3892E+04	-0.7479E+03	0.3224E+03	-0.7351E+03	-0.8843E+04	0.4054E+040.04	0.1117E+05	-0.1895E+04	0.4145E+08	-0.4066E+11		
23	3-0.6366E+04	0.4709E+04	-0.4329E+02	0.2315E+03	-0.3482E+02	-0.6368E+04	0.3167E+040.04	0.1046E+05	-0.2313E+03	0.3644E+08	-0.6845E+10		
24	3-0.6496E+04	0.5252E+04	0.5333E+03	-0.5414E+03	0.5722E+03	-0.7004E+04	0.3788E+040.07	0.1071E+05	-0.3936E+03	0.3796E+08	-0.3434E+11		
25	3-0.5385E+04	0.6415E+04	0.3754E+03	0.1222E+03	0.3783E+03	-0.5387E+04	0.2883E+040.02	0.1022E+05	0.4686E+03	0.3481E+08	0.3239E+10		
26	3-0.4493E+04	0.6711E+04	-0.8020E+02	-0.2056E+03	-0.7142E+02	-0.4498E+04	0.2414E+040.04	0.1010E+05	0.5605E+03	0.3397E+08	0.2216E+11		
27	1-0.3611E+04	0.5502E+04	-0.2044E+02	0.4944E+02	-0.2779E+02	-0.3614E+04	0.1793E+040.01	0.7954E+04	0.6200E+03	0.2109E+08	0.1340E+11		
28	1-0.3784E+04	0.5934E+04	0.1791E+02	-0.8419E+02	0.1977E+02	-0.3786E+04	0.1903E+040.02	0.8487E+04	0.6240E+03	0.2400E+08	0.1660E+11		
29	1-0.2825E+04	0.4950E+04	0.4237E+02	0.6221E+02	0.4371E+02	-0.2827E+04	0.1435E+040.02	0.6811E+04	0.7223E+03	0.1546E+08	0.1020E+11		
30	1-0.2513E+04	0.4672E+04	-0.5353E+02	-0.5910E+02	-0.5211E+02	-0.2519E+04	0.1233E+040.02	0.6329E+04	0.7002E+03	0.1335E+08	0.9631E+10		
31	1-0.1806E+04	0.4064E+04	-0.2506E+02	0.9938E+01	-0.2501E+02	-0.1806E+04	0.8906E+030.01	0.5213E+04	0.7443E+03	0.9060E+07	0.6515E+10		
32	1-0.1936E+04	0.4244E+04	0.3838E+01	-0.6855E+02	0.6255E+01	-0.1941E+04	0.9735E+030.04	0.5515E+04	0.7830E+03	0.1013E+08	0.7423E+10		
33	1-0.1383E+04	0.3770E+04	0.1339E+02	-0.9107E+00	0.1339E+02	-0.1383E+04	0.6984E+030.00	0.4616E+04	0.7999E+03	0.7102E+07	0.5094E+10		
34	1-0.1234E+04	0.3613E+04	-0.3218E+02	0.6342E+02	-0.2881E+02	-0.1242E+04	0.6066E+030.05	0.4376E+04	0.7807E+03	0.6380E+07	0.4649E+10		
35	1-0.7925E+03	0.3277E+04	-0.1018E+02	-0.2001E+02	-0.4670E+01	-0.7930E+03	0.3917E+030.03	0.3741E+04	0.8249E+03	0.4664E+07	0.3312E+10		
36	1-0.8855E+03	0.3402E+04	0.1071E+02	-0.6826E+02	0.1588E+02	-0.8905E+03	0.4532E+030.08	0.3919E+04	0.8426E+03	0.5115E+07	0.3680E+10		
37	1-0.5461E+03	0.3191E+04	0.1077E+02	-0.1742E+02	0.1135E+02	-0.5467E+03	0.2790E+030.03	0.3403E+04	0.8351E+03	0.3860E+07	0.2657E+10		
38	1-0.4401E+03	0.3013E+04	-0.1500E+02	-0.5970E+02	-0.6778E+01	-0.4485E+03	0.2209E+030.14	0.3263E+04	0.8526E+03	0.3546E+07	0.2424E+10		
39	1-0.1411E+03	0.2816E+04	0.1244E+02	-0.1244E+02	0.1344E+02	-0.1421E+03	0.7778E+020.04	0.2883E+04	0.8957E+03	0.2771E+07	0.1754E+10		
40	1-0.2070E+03	0.2891E+04	0.1826E+02	-0.4587E+02	0.2724E+02	-0.2160F+03	0.1216E+030.19	0.2992E+04	0.9006E+03	0.2983E+07	0.1945E+10		

TABLE VIII. - Concluded. SAMPLE PROBLEM (4) - OUTPUT

SAMPLE PROBLEM 3 EXPANSION OF A THICK WALL TUBE STEP 4 - 4 OF 4

STRAIN ELEMENT DATA

NEL	RC	ZC	ER	ET	EZ	ERZ	LR	LZ	LT	L1	L2	TL	TS	TH	EPEQ	NEL
1	1.08530	00.06677	-0.02121	0.01702	0.00159	0.00000	0.9794	1.0016	1.0175	1.0016	0.9794	0.00	-0.00	00.00	0.01307	1
2	1.15072	00.13351	-0.01913	0.01500	0.00105	0.00074	0.9814	1.0011	1.0153	1.0011	0.9814	0.00	00.00	00.00	0.01065	2
3	1.34771	00.06666	-0.01124	0.01061	-0.00005	-0.00030	0.9890	1.0000	1.0108	1.0000	0.9889	3.11	-0.00	00.00	0.00372	3
4	1.28141	00.13340	-0.01387	0.01182	0.00105	0.00045	0.9864	1.0011	1.0120	1.0011	0.9864	0.00	00.00	00.00	0.00608	4
5	1.47978	00.06666	-0.00798	0.00882	-0.00005	-0.00030	0.9921	1.0000	1.0089	1.0000	0.9921	3.10	-0.00	00.00	0.00093	5
6	1.54545	00.13329	-0.00694	0.00813	-0.00053	-0.00003	0.9941	0.9995	1.0082	0.9995	0.9931	3.14	-0.00	00.00	0.00002	6
7	1.74476	00.06662	-0.00502	0.00653	-0.00071	-0.00007	0.9950	0.9993	1.0066	0.9993	0.9950	3.12	-0.00	00.00	0.00000	7
8	1.67846	00.13325	-0.00560	0.00700	-0.00053	0.00013	0.9944	0.9995	1.0071	0.9995	0.9944	0.00	00.00	00.00	0.00000	8
9	1.87749	00.06662	-0.00414	0.00575	-0.00071	-0.00007	0.9959	0.9993	1.0058	0.9993	0.9959	3.12	-0.00	00.00	0.00000	9
10	1.94389	00.13324	-0.00342	0.00541	-0.00071	0.00004	0.9961	0.9993	1.0055	0.9993	0.9961	0.00	00.00	00.00	0.00000	10
11	2.14321	00.06662	-0.00300	0.00460	-0.00074	-0.00008	0.9970	0.9993	1.0046	0.9993	0.9970	3.11	-0.00	00.00	0.00000	11
12	2.07674	00.13324	-0.00324	0.00484	-0.00071	0.00002	0.9968	0.9993	1.0049	0.9993	0.9968	0.00	00.00	00.00	0.00000	12
13	2.27618	00.06662	-0.00247	0.00417	-0.00074	-0.00008	0.9975	0.9993	1.0042	0.9993	0.9975	3.09	-0.00	00.00	0.00000	13
14	2.34258	00.13323	-0.00237	0.00398	-0.00075	-0.00001	0.9977	0.9992	1.0040	0.9992	0.9977	3.13	-0.00	00.00	0.00000	14
15	2.54228	00.06661	-0.00177	0.00351	-0.00078	-0.00008	0.9982	0.9992	1.0035	0.9992	0.9982	3.06	-0.00	00.00	0.00000	15
16	2.47573	00.13323	-0.00191	0.00365	-0.00075	-0.00002	0.9981	0.9992	1.0037	0.9992	0.9981	3.12	-0.00	00.00	0.00000	16
17	2.67540	00.06661	-0.00142	0.00326	-0.00078	-0.00008	0.9986	0.9992	1.0033	0.9992	0.9986	3.02	-0.00	00.00	0.00000	17
18	2.74197	00.13323	-0.00134	0.00314	-0.00078	-0.00004	0.9987	0.9992	1.0032	0.9992	0.9987	3.08	-0.00	00.00	0.00000	18
19	2.94175	00.06662	-0.00100	0.00286	-0.00075	-0.00008	0.9990	0.9993	1.0029	0.9993	0.9990	2.87	-0.00	00.00	0.00000	19
20	2.87514	00.13323	-0.00108	0.00294	-0.00078	-0.00002	0.9989	0.9992	1.0030	0.9992	0.9989	3.08	-0.00	00.00	0.00000	20
21	1.08536	00.33377	-0.07026	0.01707	0.00112	-0.00025	0.9803	1.0011	1.0175	1.0011	0.9803	3.13	-0.00	00.00	0.01234	21
22	1.15078	00.26699	-0.01913	0.01505	0.00117	-0.00083	0.9814	1.0012	1.0154	1.0012	0.9814	3.10	-0.00	00.00	0.01070	22
23	1.34783	00.33348	-0.01124	0.01070	0.00001	-0.00040	0.9889	1.0000	1.0109	1.0000	0.9889	3.11	-0.00	00.00	0.00362	23
24	1.28147	00.26688	-0.01387	0.01187	0.00117	-0.00110	0.9864	1.0012	1.0121	1.0013	0.9863	3.07	-0.00	00.00	0.00615	24
25	1.47957	00.33325	-0.00849	0.00888	0.00001	0.00018	0.9916	1.0000	1.0090	1.0000	0.9916	0.00	00.00	00.00	0.00124	25
26	1.54596	00.26655	-0.00694	0.00814	-0.00063	-0.00027	0.9931	0.9994	1.0082	0.9994	0.9931	3.10	-0.00	00.00	0.00002	26
27	1.74479	00.33312	-0.00529	0.00655	-0.00060	0.00007	0.9948	0.9994	1.0066	0.9994	0.9948	0.00	00.00	00.00	0.00000	27
28	1.67848	00.26651	-0.00560	0.00701	-0.00063	-0.00011	0.9944	0.9994	1.0071	0.9994	0.9944	3.12	-0.00	00.00	0.00000	28
29	1.87749	00.33311	-0.00434	0.00575	-0.00060	0.00008	0.9957	0.9994	1.0058	0.9994	0.9957	0.00	00.00	00.00	0.00000	29
30	1.94388	00.26648	-0.00392	0.00541	-0.00070	-0.00008	0.9961	0.9993	1.0055	0.9993	0.9961	3.12	-0.00	00.00	0.00000	30
31	2.14319	00.33309	-0.00303	0.00459	-0.00070	0.00001	0.9970	0.9993	1.0046	0.9993	0.9970	0.00	00.00	00.00	0.00000	31
32	2.07674	00.26648	-0.00324	0.00484	-0.00070	-0.00009	0.9968	0.9993	1.0049	0.9993	0.9968	3.11	-0.00	00.00	0.00000	32
33	2.27616	00.33309	-0.00253	0.00416	-0.00070	-0.00000	0.9975	0.9993	1.0042	0.9993	0.9975	3.14	-0.00	00.00	0.00000	33
34	2.34257	00.26647	-0.00232	0.00398	-0.00075	-0.00008	0.9977	0.9993	1.0040	0.9993	0.9977	3.09	-0.00	00.00	0.00000	34
35	2.54226	00.33308	-0.00178	0.00350	-0.00076	-0.00003	0.9982	0.9992	1.0035	0.9992	0.9982	3.12	-0.00	00.00	0.00000	35
36	2.47572	00.26647	-0.00191	0.00365	-0.00075	-0.00009	0.9981	0.9993	1.0037	0.9993	0.9981	3.07	-0.00	00.00	0.00000	36
37	2.67538	00.33307	-0.00144	0.00325	-0.00076	-0.00002	0.9985	0.9992	1.0033	0.9992	0.9985	3.11	-0.00	00.00	0.00000	37
38	2.74145	00.26646	-0.00134	0.00314	-0.00079	-0.00008	0.9987	0.9992	1.0032	0.9992	0.9987	3.00	-0.00	00.00	0.00000	38
39	2.94172	00.33308	-0.00099	0.00285	-0.00079	-0.00002	0.9990	0.9992	1.0029	0.9992	0.9990	3.06	-0.00	00.00	0.00000	39
40	2.87513	00.26646	-0.00108	0.00294	-0.00079	-0.00006	0.9989	0.9992	1.0030	0.9992	0.9989	2.95	-0.00	00.00	0.00000	40

ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.	ELE	EL. EN. DEN	PLS EN. DEN	TOT EN. DEN	HYDRO. TENS.
1	00.57441E+02	00.13848E+03	00.19542E+03	-0.15028E+04	2	00.56507E+02	00.11198E+03	00.16848E+03	-0.20391E+04
3	00.47585E+02	00.37991E+02	00.85576E+02	-0.34346E+03	4	00.49709E+02	00.62620E+02	00.11233E+03	-0.53155E+03
5	00.45402E+02	00.94206E+01	00.54423E+02	00.79523E+03	6	00.44254E+02	00.16951E+00	00.44423E+02	00.64541E+03
7	00.26643E+02	0.E+00	00.26643E+02	00.72736E+03	8	00.31448E+02	0.E+00	00.31448E+02	00.76496E+03
9	00.19858E+02	0.E+00	00.19858E+02	00.79560E+03	10	00.17660E+02	0.E+00	00.17660E+02	00.69473E+03
11	00.12085E+02	0.E+00	00.12085E+02	00.74691E+03	12	00.13552E+02	0.E+00	00.13552E+02	00.77745E+03
13	00.95776E+01	0.E+00	00.95776E+01	00.82458E+03	14	00.86764E+01	0.E+00	00.86764E+01	00.77881E+03
15	00.65002E+01	0.E+00	00.65002E+01	00.81804E+03	16	00.70911E+01	0.E+00	00.70911E+01	00.84055E+03
17	00.54622E+01	0.E+00	00.54622E+01	00.89209E+03	18	00.50638E+01	0.E+00	00.50638E+01	00.86274E+03
19	00.41200E+01	0.E+00	00.41200E+01	00.93266E+03	20	00.43801E+01	0.E+00	00.43801E+01	00.91056E+03
21	00.56306E+02	00.13079E+03	00.18717E+03	-0.10974E+04	22	00.56178E+02	00.11251E+03	00.16869E+03	-0.16955E+04
23	00.47473E+02	00.38949E+02	00.86422E+02	-0.23132E+03	24	00.49820E+02	00.63504E+02	00.11332E+03	-0.39356E+03
25	00.45419E+02	00.12553E+02	00.57963E+02	00.40881E+03	26	00.44421E+02	00.17050E+00	00.44592E+02	00.59045E+03
27	00.27644E+02	0.E+00	00.27644E+02	00.61996E+03	28	00.31528E+02	0.E+00	00.31528E+02	00.76404E+03
29	00.20417E+02	0.E+00	00.20417E+02	00.72232E+03	30	00.17650E+02	0.E+00	00.17650E+02	00.70015E+03
31	00.12110E+02	0.E+00	00.12110E+02	00.74433E+03	32	00.13547E+02	0.E+00	00.13547E+02	00.76302E+03
33	00.96171E+01	0.E+00	00.96171E+01	00.79967E+03	34	00.86645E+01	0.E+00	00.86645E+01	00.78066E+03
35	00.64717E+01	0.E+00	00.64717E+01	00.82489E+03	36	00.70819E+01	0.E+00	00.70819E+01	00.84261E+03
37	00.54569E+01	0.E+00	00.54569E+01	00.85515E+03	38	00.50508E+01	0.E+00	00.50508E+01	00.85201E+03
39	00.40841E+01	0.E+00	00.40841E+01	00.89574E+03	40	00.43672E+01	0.E+00	00.43672E+01	00.90084E+03

THE ELASTIC ENERGY IS 00.185877E+03
THE PLASTIC ENERGY IS 00.104999E+03
THE TOTAL ENERGY IS 00.290875E+03FOR A LOAD OF 00.255409E+05
THIS IS INCREMENT 4 - 4 OF 4
THE APPLIED LOAD IS 25540.9322THE INC. LOAD IS 19.6976

TAPE RESTART GENERATION...STEP 4 - 1 OF 4

Lewis Research Center,
National Aeronautics and Space Administration,
Cleveland, Ohio, November 19, 1973,
501-21.

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