ELASTIC-PLASTIC STRESS ANALYSIS OF AN EDGE CRACK SPECIMEN AND EVALUATION OF FRACTURE MECHANICS PARAMETERS

by

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ABSTRACT

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Finite element stress analysis was used to calculate tne fracture mechanics parameters, tne so-called J-and M-integrals, for a tensile edge notcn specimen (Figure 2).

A comparison of tne finite element load-displacement was made witn tne experimental results obtained from tne Department of Macromolecular science at case western Reserve University. Also, for a class of problems wnere tne plastic zone remains localized near tne crack tip, estimation tecnniques were employed to determine tne J-integral values for tne same tensile specimen.

Tne M-integral formulas suitable for numerical evaluation were derived. one set of equations employed tne concept of isoparametric element (a computer program could be written using tnese equations). Applying tnese equations, a manual calculation was performed to evaluate tne M-integral values. Tnese values were compared witn tne values obtained

from an estimation technique

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CHAPTER I

INTRODUCTION

1.1 Historical Background

The application of concepts of fracture mechanics has become the primary approach in controlling the brittle fracture and the fatigue failures in structures. From 1913 until the early 1960s, very little research work was done in the area of fracture mechanics. In 1965 the American society for Testing Material (ASTM) formed Committee E-24 on Fracture Testing of Metals. Since then, the literature on fracture mechanics has been growing at a very rapid pace [1,2].

The decade of the sixties can be characterized as a search for valid test methods and an exploration of fracture theories. In the seventies, considerable rethinking and regrouping occured with the introduction of new concepts such as the R-Curve and J-Integral [1,2].

1.2 Concepts and Application of Fracture Mechanics

The phenomenon of fracture has been observed by all on a daily basis. Operations that produce certain surface geometrics, such as chopping of wood and the cutting of glass to desired sizes illustrate intentionally induced fractures.

The accidental cracking of windshields on automobiles and the catastrophic breaking of large structures such as ships and oil tankers, typify undesirable fracture. Fracture process initiates not only with the presence of a crack or a flaw somewhere in the structure, but also the stress level which can induce the crack propagation leading to a catastrophic failure.

Brittle fracture is a type of catastrophic failure in structural materials that occurs at an extremely high speeds (as high as 7,000 ft/sec) [3]. It is characterized by a flat fracture surface (cleavage) with little or no shear lips, and at average stress levels below those of general yielding Stresses. Historical review illustrates the fact that brittle fractures can occur in engineering structures such as tanks, pressure vessels, ships, bridges, airplanes, etc Numerous factors such as the service temperatures, fracture toughness, welding, residual stresses, fatigue, constraint conditions, can contribute to brittle fractures in large welded structures. However, the primary factors that control the susceptibility of a structure to brittle fracture are FRACTURE TOUGHNESS (K_c) of the material, CRACK SIZE (a) and STRESS LEVEL (σ). The general relationship among material tougnness (K_c), nominal stress (σ), and crack size (a) is shown schematically in Figure 1 [3]. It shows that there are many combinations of stresses and crack sizes which may cause fracture in a fabricated structure having a particular value Of K_c at a particular service temperature, loading rate and plate thickness. Conversely, there are many combinations of stresses (σ_0) and flaw sizes (a_0) that will not cause failure of a particular structural material. To prevent fracture, the actual stresses and flaw sizes must be below the levels shown in Figure 1.

If the toughness of the material is sufficiently high, brittle fracture will not occur, and the failure under tensile loading will precede a large plastic deformation. For large structures where the elastic-plastic behavior is observed with the formation of a large plastic zone prior to the failure, the linear elastic analysis used to calculate the stress intensity factors is not applicable. Under this condition, analysis other than linear elastic fracture mechanics (LEFM) must be used. J-INTEGRAL, R-CURVE analysis and CRACK OPENING DISPLACEMENT (COD) are the extensions of LEFM into elastic-plastic fracture mechanics.

1.3 The Objectives and Scope of the Study

Recently, however, it has been shown [4] that a single field characterization using the J-integral is not sufficient to model the crack growth in the elastic-plastic region. Some new parameters such as L, M, and N integrals [5] have been introduced. Their application in predicting crack growth in structures seems to be promising. The numerical evaluation of these fracture mechanics parameters is complicated due to the nature of the equations describing these parameters. One of the objectives of this study is to evaluate some of these parameters sucn as the J- and M-Integrals.

This calculation requires an accurate computation of the stress and strain fields near the crack tip. In the present study the finite element method (FEM) is cnosen to do such an analysis on a cracked retangular plate (Figure 2). Since non-linear finite element analysis (FEA) depends upon the type of mesn (and loading step selection and tolerance), another objective of this work is to see the effect of different grid sizes on the FEA results. To check results, comparisons of tne results of FEA are made witn experimental data.

Chapter II

Basic Theories and Their use in EPFM

2.1 Introduction

This chapter describes various concepts used in the present work, presenting the basic theories and tnier use in Elastic-Plastic Fracture Mechanics (EPFM). A brief discussion of plane stress and plane strain finite element formulation (FEA) in the elastic range is presented. The governing equations for the eight node isoparametric element, the Von Mises yield criteria, and the theoretical background of the J-integral are also described for the sake of completeness. A detailed account of the procedure for non-linear FEA can be found in [6].

2.2 Finite Element Method of Stress Analysis

Plane stress and plane strain problems can be solved with the use of triangular or rectangular elements. However, more accurate results are obtained with a grid of rectangular elements [7,8,9].

2.2.1. Virtual Work Expression

When the principles of virtual work and virtual complementary work are applied to deformable solids, it is necessary to account for the work of the internal forces as well as that of the external forces. Then equilibrium [7,8,9] is identified by

$$W_i + W_e = 0$$

If a solid is subjected to a set of body forces f then by the Virtual Work Principle we can write

$$\int_V [\delta\epsilon]^T \sigma \, dV - \int_V [\delta u]^T f \, dV - \int_{\Gamma_t} [\delta u]^T t \, d\Gamma = 0 \qquad (2.1)$$

where σ is a vector of stresses, t is a vector of boundary tractions, δu is a vector of virtual displacements, $\delta\epsilon$ is a vector of associated virtual strains and V is the volume. $d\Gamma$ is an element of arc length along Γ, Γ_t is that part of the boundary on which boundary tractions are prescribed and Γ_u is that part of the boundary on which displacements are prescribed [7].

2.2.2 Displacement Functions

The first step in the analysis is to select a set of displacement functions that give the displacements of every point within the element. In a two dimensional analysis the chosen form of the displacement functions Is a polynomial as follows:

$$[W] = \begin{bmatrix} u\ (x,y) \\ \\ v\ (x,y) \end{bmatrix} \qquad (2.2)$$

where $u\ (x,y) = a_0 + a_1x + a_2y + a_3x^2 + a_4xy + a_5y^2 + \ldots$

$v\ (x,y) = b_0 + b_1x + b_2y + b_3x^2 + b_4xy + b_5y^2 + \ldots$

or

$$\begin{Bmatrix} u\ (x,y) \\ - \\ v\ (x,y) \end{Bmatrix} = \begin{bmatrix} [F\ (x,y)] & 0 \\ & \\ 0 & [F\ (x,y)] \end{bmatrix} \begin{Bmatrix} \{a\} \\ \\ \{b\} \end{Bmatrix} \qquad (2.3)$$

In which u (x,y) and v (x,y) are the two components of displacements in the x and y directions respectively and F (x,y) is a polynomial for displacement function. For a rectangular element, the nodal displacement vector can be expressed as an eight-component vector involving the u and v displacements at nodes 1,2,3, and 4.

$$[d] = [u_1\ v_1\ u_2\ v_2\ u_3\ v_3\ u_4\ v_4]^T \qquad (2.4)$$

The displacement function [w] can be expressed [7,9] in terms of the nodal displacements

$$[W] = [A][d]$$

The strains are obtained in terms of the nodal displacements and have the form

$$[\epsilon] = [B][W] = [B][A][d] \qquad (2.5)$$

The elastic relationship between stress and strain components for plane stress is

$$\begin{bmatrix} \sigma_x \\ \sigma_y \\ \sigma_{xy} \end{bmatrix} = (E/(1-v^2)) \begin{bmatrix} 1 & v & 0 \\ v & 1 & 0 \\ 0 & 0 & (1-v)/2 \end{bmatrix} \begin{bmatrix} \epsilon_x \\ \epsilon_y \\ \epsilon_{xy} \end{bmatrix}$$

which can be written in the matrix form as

$$\sigma = [D][\epsilon] = [D][B][d] \qquad (2.6)$$

2.3 Isoparametric Representation

In a finite element representation, the displacements and strains [7,8,9,] for a solid mechanics applications may be expressed by

$$\bar{u} = \sum_{i=1}^{8} N_i \, d_i \tag{2.7}$$

$$\varepsilon = \sum_{i=1}^{8} B_i \, d_i \tag{2.8}$$

where for node i, d_i is the vector of nodal variables, N_i is the global shape function and B_i is the global strain-displacement matrix.

If (2.7) and (2.8) are substituted in the virtual work expression (2.1) then the following is obtained

$$\int_V [B]^T \sigma \, dV - \int_V [N_i]^T b \, dV - \int_{\Gamma_t} [N_i]^T t \, d\Gamma = 0 \tag{2.9}$$

The displacement can be expressed in the usual way as

$$u^{(e)} = \sum_{i=1}^{r} N_i^{(e)} \, d_i^{(e)} \tag{2.10}$$

where, for local node I of element e, $N_i^{(e)}$ is the global shape function and the vector of variables is $d_i^{(e)}$. There are r local nodes in each element e.

According to Figure 3, the shape functions [6] for a typical 8 node isoparametric element is as follows:

(a) Corner nodes

$$N_i^{(e)} = (1/4)\,(1 + \xi\xi_i)\,(1 + \eta\eta_i)\,(\xi\xi_i + \eta\eta_i - 1)$$

$$i = 1,3,5,7 \tag{2.11}$$

(b) Midside nodes

$$N_i^{(e)} = (\xi_i^2/2)\,(1 + \xi\xi_i)\,(1 - \eta^2) + (\eta_i^2/2)$$

$$(1 + \eta\eta_i)(1 - \xi^2)$$

$$i = 2,4,6,8 \qquad (2.12)$$

In an isoparametric representation the following formula is used for the x,y coordinates within an element:

$$\begin{Bmatrix} x^{(e)} \\ y^{(e)} \end{Bmatrix} = \sum_{i=1}^{r} \begin{bmatrix} N_i^{(e)} & 0 \\ 0 & N_i^{(e)} \end{bmatrix} \begin{Bmatrix} x_i^{(e)} \\ y_i^{(e)} \end{Bmatrix} \qquad (2.13)$$

The Jacobian matrix [6] is evaluated as

$$J^{(e)} = \begin{bmatrix} \frac{\partial x}{\partial \xi} & \frac{\partial y}{\partial \xi} \\ \frac{\partial x}{\partial \eta} & \frac{\partial y}{\partial \eta} \end{bmatrix} \qquad (2.14)$$

or

$$J^{(e)} = \begin{bmatrix} \sum_{i=1}^{r} \frac{\partial N_i^{(e)}}{\partial \xi} x_i^{(e)} & \sum_{i=1}^{r} \frac{\partial N_i^{(e)}}{\partial \xi} y_i^{(e)} \\ \sum_{i=1}^{r} \frac{\partial N_i^{(e)}}{\partial \eta} x_i^{(e)} & \sum_{i=1}^{r} \frac{\partial N_i^{(e)}}{\partial \eta} y_i^{(e)} \end{bmatrix}$$

The strain displacement relationships are expressed as

$$\epsilon^{(e)} = \sum_{i=1}^{r} B_i^{(e)} d_i^{(e)} \qquad (2.15)$$

where $B_i^{(e)}$ is the strain matrix

Since a linear stress-strain relationship is obtained within each element

$$\sigma^{(e)} = D^{(e)} \epsilon^{(e)} = D^{(e)} \sum_{j=1}^{r} B_j^{(e)} d_j^{(e)} \qquad (2.16)$$

Tnen the contribution [6] from element e to the first term in (2.9) is given as

$$\sum_{j=1}^{r} K_{ij}^{(e)} d_j^{(e)} = \int_{Q^{(e)}} [B^{(e)}]^T D^{(e)} \left(\sum_{j=1}^{r} B_j^{(e)} d_j^{(e)} \right) dQ \qquad (2.17)$$

wnere $K_{ij}^{(e)}$ is tne submatrix of tne stiffness matrix $K^{(e)}$

The contribution from element e to tne second term in (2.9) is given as

$$f_{Bi}^{(e)} = \int_{Q} [N^{(e)}]^T b^{(e)} dQ$$

For tne third term, tne contribution from element e is

$$f_{Ti}^{(e)} = \int_{T^{(e)}} [N^{(e)}]^T t^{(e)} dT$$

wnere $T_t^{(e)}$ is tnat part wnicn coincides witn a boundary of element e. Of course, for many elements tnere will be no Contribution to $f_{Ti}^{(e)}$ [6].

This leads to an assembly procedure and

$$[K] \{d\} = \{f\}$$

Solution for {d} can be obtained by

$$\{d\} = [K]^{-1} \{f\}$$

$$\{\sigma\} = [D] [B] \{d\}$$

2.4 The Mathematical Theory of Plasticity

For any three-dimensional stress state [10] there exists a cubic equation wnose tnree roots are tne tnree principal stresses. This equation is

$$\sigma^3 - I_1 \sigma^2 - I_2 \sigma - I_3 = 0$$

Regardless of the coordinate system chosen, these three roots of the equation which art principal stresses remain the same for a given state of stress. In other words, the coefficients I_1, I_2 and I_3 must not vary with a change in the coordinate system. These coefficients are referred to as the invariants of the stress tensor and are denoted as follows:

$$I_1 = (\sigma_x + \sigma_y + \sigma_z)$$

$$I_2 = -(\sigma_x \sigma_y + \sigma_y \sigma_z + \sigma_z \sigma_x)$$

$$I_3 = (\sigma_x \sigma_y \sigma_z)$$

The magnitude of the mean normal stress, σ_m , is equal to one third the algebriac sum of the three normal stresses; therefore, $I_1 = 3\sigma_m$. Thus the first invariant is a function of the hydrostatic or mean component and should not influence yielding. The two most common yield criteria employed in the description of the behavior of metals are the Tresca criterion and the Von Mises criterion.

2.4.1 <u>The Yield Criteria</u>

The Von Mises criterion [6,10] predicts that yielding occurs when:

$$(\sigma_1 - \sigma_2)^2 + (\sigma_2 - \sigma_3)^2 + (\sigma_3 - \sigma_1)^2 = \text{constant}$$

σ_1 , σ_2 and σ_3 are principal stresses. In a more general form.

$$(\sigma_x - \sigma_y)^2 + (\sigma_y - \sigma_z)^2 + (\sigma_z - \sigma_x)^2 + 6(\tau_{xy}^2 + \tau_{yz}^2 + \tau_{zx}^2) = \text{constant}$$

Let ‾ (effective stress) be a function of the applied stresses. Whenever its magnituae reacnes the yield stress σ_y for tne material in uniaxial tension, tnen that appiied stress state should cause yielding to occur. Thus:

Von Mises: $\bar{\sigma} = (1/\sqrt{2})[(\sigma_1 - \sigma_2)^2 + (\sigma_2 - \sigma_3)^2 + (\sigma_3 - \sigma_1)^2]^{1/2}$

According to tne Von Mises criterion when $\bar{\sigma}$ reaches a value of 3 K where K is the maximum allowable shear stress, yielding is predictea.

2.4.2 Plastic Work

After initial yielding, the stress level at which further plastic deformation occurs may be dependent on tne current degree of plastic straining. For an isotropic nardening model, tne original yield surface expands uniformly witnout translation. Tne total plastic work or strain hardening is as follows:

$$K = W_p = \int \sigma_{ij} (d\epsilon_{ij})_p \qquad i,j = 1,2,3$$

K is tne nardening parameter and $(d\epsilon_{ij})_p$ are the plastic components of strain occuring during a strain increment.

2.4.3 Flow Rules or Plastic Stress/Strain Relation

After initial yielding tne material benavior will be partly elastic and partly plastic. The cnanges of strain are assumed to be divided into elastic and plastic components during any increment of stress, so that

$$d\epsilon_{ij} = (d\epsilon_{ij})_e + (d\epsilon_{ij})_p \qquad (2.18)$$

The elastic strain increment is related to tne stress increment by tne incremental form of $\sigma = D\epsilon$. The relationship between tne plastic strain component and the stress increment can be expressed as [6]

$$d(\epsilon_{ij})p = d\lambda(\partial Q/\partial \sigma_{ij}) \tag{2.19}$$

For associative flow rule, assume f = Q where f is tne yield function, then

$$d(\epsilon_{ij})p = d\lambda(\partial f/\partial \sigma_{ij}) \tag{2.20}$$

d is a proportionality constant termed tne plastic multiplier, and Q is the plastic potential. $\partial f/\partial \sigma_{ij}$ is a vector and it provides the direction cosines of tne normal to tne yield surface at tne stress point under consideration. Equation (2.19) becomes tne flow rule since it governs the plastic flow after yielding.

2.5 The J-Integral Concept

2.5.1 Definition of J-Integral

Rice's J-integral definition [11] is applicable to a homogeneous body of linear or nonlinear elastic material free of body forces. It is subjected to a two-dimensional deformation field so that all stresses σ_{ij} depend only on two cartesion coordinates $x=(x_i)$, $(i = 1,2)$.

For a tree notcn having fiat surfaces parallel to tne x-axis and a rounded tip Γ_t (figure 4), the J-integral is defined as a path integral for an open path surrounding the notcn tip;

$$J = \int_{\Gamma_t} (W dx_2 - T_i \frac{\partial u_i}{\partial x_1} ds) \tag{2.21}$$

Tne J-integral has tne same value when computed by an integration along either Γ_1 or Γ_2 provided that the identical positive normal airection is usea for botn patns. Tne patn independence of J integral for linear and non-linear material nas been proved theoretically in [12].

2.5.2 J-Integral Evaluation Methods

The evaluation of tne J-integral can be acnieved by selecting an integral patn and evaluating equation (2.21) by numerical integration. There are two choices to select tne integral patns: a path passing through the nodal points or a patn passing through tne integration points. The J-integral evaluation, using a path passing tnrougn tne nodal points of the FE grid requires an extrapolation of known quantities sucn as stresses and derivatives of the displacements from the integration points to the nodal points . The advantage of this metnod is tnat there are no requirements for tne mesn to define a smootn patn. The disadvantage is, of course, the extra work required for extrapolation procedure. The accuracy might be less tnan tnat of the second metnod in which the contour is aiong a line passing tnrougn the integration points of tne elements. However, the mesh for tne second metnod nas to be able to define a smooth integration path. All tne common element types can be used in EPFM, but tne most common types used have been the higher order elements. These elements are well Known because of their flexibility to model complex structures and the capability to provide good accuracy with a coarse mesn.

If a 3x3 integration scneme is used to evaluate tne element stiffness, ttlree patns can be defined tnrougn one element. It nas been observed tnat tne patns close to tne boundary of tne element furnisn almost identical J-integrals while tne one tnrougn tne middle gives approximately a 10% higner value. It nas been demonstrated by Bakker [13] tnat tne average value of all tnree paths of integration should be considered. This average is tnen tneoretically equal to tne J-integral found by tne virtual crack extention method [11].

CHAPTER III

FINITE ELEMENT (FE) ANALYSIS

3.1 Introduction

In this investigation, an edge crack specimen is analyzed using the Nonlinear Finite Element Program (NFAP) developed at the University of Akron [14]. The edge notch geometry considered in this study is shown in Figure 2. The specimen contains a 60^o "V" notch of 1mm length. The dimensions of the specimen are:

$$H = 40 \quad mm$$

$$2W = 20 \quad mm$$

$$T = 1.33 \ mm$$

In which H is the length, 2W is the width and T is the thickness of the specimen [Figure2]. For symmetry reasons only one-half of the test plate was analyzed using conventional 8-node isoparametric elements.

3.2 Model and Properties of the Specimen

Figure 5(a) shows the stress-strain relation for the material of the specimen and Figure 5(b) shows the applied stress with time along the upper and lower edges of the specimen. As yield criterion, the Von Mises condition was used. In the plastic state, the associated flow rule of the Prandtl-Reuss equations was assumed to analyze this specimen having Young's modulus of elasticity $E=81357 \ N/mm^2$, Poisson's ratio of $\nu=0.30$ and yield stress of $\sigma_y=834.26 \ N/mm^2$.

To study the effect of coarse-mesh on tne elasto-plastic analysis, four different finite element meshes were designed. Meshl, M1 (Figure 6) had as many distorted elements as Mesh2, ME (Figure 7) witn the exception that it had a layer of singular elements surrounding the crack tip Mesh3, M3 (Figure 8) had tne same rectangular layout as mesh4, M4 (Figure 9) with the only difference being that it had singular elements surrounding tne crack tip

The singular elements (Figure 10) were created by the so-called "1/4 point technique" [15] in wnicn tne nodes of the crack tip are collapsed to form a triangular shape element. Tne midside nodes of the second order elements are placed at 1/4 distance from the crack tip node, to obtain tne $1/\sqrt{r}$ singularity.

3.3 Results and Comparison of the Meshes

It was observed tnat these results for crack opening displacements obtained from tne meshes did not differ significantly from eacn otner (Figure 11). The results of stresses obtained from MI and M3 were close to each other as were the results for M2 and M4 (Figure 12). It could be seen tnat tne results for tne grids witn singular elements predict higner stress near the crack tip. It shows the singular nature of stresses near the crack tip.

Figure 13 shows tne plastic-zone growtn for different meshes employed in this investigation for a/w = 0.5 and σ/σ_y = 0.2. Plastic deformation occurs when the elastic stress in the vicinity of the crack tip is higher than the yield stress of the material. The effect of the plastic zone is to increase the displacements and lower the stiffness of the plate. The length of the plastic-zone , r_y, under plane stress conditions can be estimated C33 by the following formula:

$$r_y = (1/2\pi)(K/\sigma_{ys})$$

on comparing the plastic-zone sizes in the neighborhood of the crack in the test specimen, it was found that the M3 produces result which is closer to the estimated value according to the Table 1.

Eight rectangular paths [Figure 14] passing through the Gauss integration points were used to calculate Rice's J-integral (2.21). The a/w for all the finite element meshes was 0.5. Figure 15 shows the comparison of J-values between M3 and M4 obtained from Table 2. For linear-elastic behavior, the J-integral which is the energy release rate per unit crack extension, is identical to G. Therefore, for linear-elastic plane-stress conditions the following formulas are employed to calculate the stress intensity factor and the J-integral:

$$K_I = \sigma\sqrt{\pi a}\, f(a/b)$$

and

$$G = J = (\alpha)^2 (K_I^2/E)$$

For a single edge notch specimen C33 f(a/b) = 2.86 when a/w is equal to 0.5. It was found that the J-integral value obtained from M4 was closer to the theoretical value [table 3]. As a result, the coarse-mesh procedure improves the accuracy and also reduces the need for a large number of elements near the crack tip. It was also found that the maximum relative deviation between the J-values on the paths obtained from M4 was 4.5% over the whole range of loading. Thus, it can be stated that, in the case of monotonic loading, the J-integral (2.21) maintains its path independent property within numerical accuracy (Figure 16) even if a flow theory of plasticity is used.

Because the J-integral value obtained from M4 is closer to the theoretical value (table 3), therefore, the finite element mesh4 was employed in the study.

3.4 Comparison of the FE Analysis Load-Displacement with Experimental Result

A comparison is made between the load displacement obtained from finite element analysis and the experimental data from the Department of Macromolecular Science at Case Western Reserve University [16]. The experimental test was conducted with a compression molded sheet of Bisphenol A-polycarbonate with a MFI=2-3 supplied by D O Chemical Company. Originally a specimen was milled at very low speed to the dimensions 120 X 20 X 0.33 mm. A 60^{o} "V" notch of 1mm depth was introduced at the middle of one edge of the specimen. Fatigue tests are conducted in a laboratory atmosphere on an MTS-800 machine using sinusoidal waveform at a frequency of 0.5 HZ. The loading was tension-tension with a maximum stress of 33 N/mm^2 and a minimum to maximum load ratio R=0.4. Tne distance between the grips was 80 mm. The crack and the surrounding damage were followed visually using a traveling optical microscope attached to a video camera assembly, equipped with a visual display unit from which the entire history of the crack propagation was recorded.

A two-dimensional finite element program was employed to analyze the same experimental specimen using tne grid M4 (Figure 9) in which 383 nodes and 113 isoparametric elements were used. Figures 17(a) and 17(b) show the stress-strain relation and tne displacement controlled loading along the upper and lower edges of the specimen [Figure 2] with a length (H) of 40 mm, width (2W) of 20 mm and thickness (T) of 0.33 mm. The specimen had an elastic modulus (E) of 2000 N/mm^2, a yield stress (σ_y) of *70* N/mm^2 and Poisson's ratio (ν) of 0.33.

Figure 18 snows a comparison between the experimentally measured load-displacement and tne load-displacement Obtained by finite element analysis load-displacement curve. The toad-displacement results for both tne experimental test and finite element analysis are close to each Other in the elastic range (approximately 15%). But tne deviation increases above the elastic range (approximately *20%).* However, the results of an elastic-plastic FE analysis can differ considerably, depending on tne theoretical formulation used in the computer program and on the structure. variables such as step size of the loading, tolerance, and numerical schemes utilized in the equilibrium iterations also play an important role on the accuracy of the results obtained by FE analysis.

Figure 19 shows the crack opening displacement at various stress levels for the specimen. Figures 20 and 21 show the plastic zone growths when a/w = 0.3 and a/w = 0.7. The J values for different crack lengths at various stress levels are shown in Figure 22 obtained from Tables 4,5,6,7,8 and 9.

CHAPTER IV

ESTIMATION OF J-INTEGRAL BY DIFFERENT TECHNIQUES

4.1 Introduction

The application of the FE method to practical problems is usually time consuming and requires expensive computer analysis which can be prohibitive for the engineer. Therefore, the use of simplified techniques for the calculation of the J-integral provides a useful alternative. These estimation techniques in combination with the experimental load-displacement data are significantly easier and more economical to use than a conventional finite element procedure which models the details of a geometry with crack length a. These techniques which will be introduced in this chapter for determining the J-integral are formulated for a class of problems where the plastic zone remains localized near the crack tip.

4.2 Estimation Techniques to Evaluate J-Integral

The first approximate formula employed here is based upon the potential energy difference between two identically loaded specimens having crack sizes that differ infinitesimally. This formula is exact for linear loading and rigid-plastic material response, and is shown to predict J accurately in the elastic-plastic range of loading [17]. The basis of the second approximate J-integral formula is the extension of the elastic strain energy release rate to elastic-plastic loads. This is particularly suited for contained plasticity. When the global load-deflection curve exhibits non-linear behavior, this J-approximation formula deviates from the actual J-integral [17]

4.2.1 J-Calculated From The Load-Displacement Curve Method (Method2).

In the elastic range, the J-integral is identical to the elastic energy release rate G. This is expresed by

$$J_e = G = K_I^2/E \tag{4.1}$$

K is the Mode I stress intensity and E is the Young's modulus. The J-integral formula for contained plasticity can be interpreted as the potential energy difference between two identically loaded specimens having different crack sizes [figure 23]. That is,

$$J = -(1/B)\frac{\partial U}{\partial a} \tag{4.2}$$

U is the potential energy, a is the crack length, and B is the specimen thickness.

Graphically, the potential energy difference, dU, for two specimens with crack lengths a and a+da is equal to the area between the load versus displacement curves as illustrated in Figure 23. This area equals BJda (see equation (4.2). The following expression for J is derived

[17] from equation (4.2).

(4.3)

P is any elastic load. In particular, P can be cnosen to be tne limit load. The J values are computed employing the equation (4.3) and the load-displacement curves for different crack sizes [Figure 23]. Interpolation by polynomials was performed to find tne polynomials of degree four for the load-displacement curves $f_1(\delta)$, $f_2(\delta)$ and $f_3(\delta)$. The following polynomials are employed to calculate the areas Detween the load-displacement curves for different crack lengths,

$$f_1(\delta) = -1.46\,\delta^4 + 0.49\,\delta^3 - 3.69\,\delta^2 + 148.84\,\delta \quad (4.4)$$

$$f_2(\delta) = 104.58\,\delta^4 - 573\,\delta^3 + 970.5\,\delta^2 - 373\,\delta \quad (4.5)$$

$$f_3(\delta) = -7.73\,\delta^4 + 35\,\delta^3 - 56.72\,\delta^2 + 185.79\,\delta \quad (4.6)$$

Table 10 snows tne J values obtained by employing equation (4.3) for different crack lengths.

4.2.2 J-Calculated From The Generalized Stiffness Gradient Method (Method3).

The stiffness gradient method Is exact if tne global force-displacement curve is linear. In otner words, if tne force-displacement curves of a specimen with crack lengths a and a+da are represented by $f_1(\delta)$ and $f_2(\delta)$ respectively Satisfy the condition that the ratio f_1/f_2 remains constant [Figure 24]. Tnen the stiffness gradient method becomes exact. The fact tnat tne ratio remains constant means tnat the force f is separable. If H is a function of crack size a and F is a function of displacement δ then force f can be written as [17]:

$$f = H(a)\, F(\delta) \qquad (4.7)$$

It was found that the maximum relative deviations between the f_1/f_2 and f_2/f_3 values [Figure 24] obtained from Tables 5, 6, and 7 are 8% and 5% respectively over the whole range of loading. Thus the stiffness gradient method can be employed here to estimate the J values.

Consider the force-displacement curves of a cracked specimen with crack lengths a and a+da, defined by f_1, f_2 and f_3. The function f_1, f_2 and f_3 can be subdivided into n linear segments as shown in Figure 24. The J-integral is given by the sum

$$J = \sum_{i=1}^{n} \alpha_i w_i \qquad (4.8)$$

where

$$\alpha_i = -\frac{1}{B m_i} \cdot \frac{dm_i}{da}$$

w_i is the area under the load-displacement curve in the ith segment, B is the specimen thickness, m_i defines the slope of the ith linear segment of f_1 and m'_i defines the slope of the corresponding f_2 curve [17].

The areas under the load-displacement curves were calculated using the trapezoidal rule, that is

$$w = \sum \left\{ F_{i-1} + \frac{\Delta F_i}{2} \right\} \Delta u_i$$

Table 10 shows the J values obtained by employing equation (4.8) for different crack lengths

4.3 Results and Comparisons of the Estimated Techniques with FE Method (Method1).

Table 10 shows the comparison of the J-values computed from the elastic-plastic FE method (Method1), with the approximate load-displacement method (Method2), and the approximate stiffness gradient method (Method3). As it can be seen, there exists a slight deviation for both methods when the crack length is 6mm. But as the crack length gets smaller (4mm) and closer to the edge notch, then, deviation increases [table 10]. Both estimated tecnniques Which have been introduced in this chapter show tne notch effect on tne J values wnen the crack tip is close to tne notcn (within 3 mm). However, it was found that the approximate load-displacement curve method provides better results in comparison with the stiffness gradient method

CHAPTER V

NUMERICAL CALCULATION OF M-INTEGRAL

5.1 Introduction

The path independent M-integral formulas are derived using the isoparametric element. The M-values are numerically caculated by using the results from the finite element analysis. A comparison is made between the numerically calculated M-values and the theoretical values obtained by using an estimation technique.

5.2 Definition of M-Integral

The M-integral [4] represents the potential energy release rates with respect to isotropic expansion of the active zone [Figure 23]. The M-integral [18] is defined as follows:

$$M = \int_{\Gamma} (f\, x_k n_k - T_i x_k u_{i,k}) \, ds ; \qquad k = 1,2 \qquad (5.1)$$

where T_i is the traction vector defined according to the outward normal n along Γ , $T_i = \sigma_{ij} n_j$, and ds is an element of arc length along Γ . x_k is a variable along the path on which the integration takes place. The magnitude of x_k depends on the location of the integration points along the path to the origin where the crack tip is [Figure 25].

Knowles and E. Sternberg [18] applied Noether's theorem to elastostatics and obtained the path independency of the M integral for a linear, homogeneous and isotropic medium. Shortly after the J. Knowles and E. Sternberg publication, the physical interpretation of M integral was discussed by B. Budiansky and J. Rice [20].

5.3 Derivation of J and M-Integrals Formulas Suitable for Numerical Evaluation.

The expression for J-integral can be written as:

$$J_K = \int_{\Gamma} (f\, n_K - T_i\, u_{i,K})\, ds \; ; \qquad K = 1,2 \qquad (5.2)$$

T_i is the traction vector defined according to the outward normal n along Γ , $T_i = \sigma_{ij}\, n_j$, and ds is an element of arc length along Γ .

Figure 26 shows rectangular contours surrounding the crack tip of a crack in a two dimensional body. Derivation of formulas for the J- and M-integrals for the path 2-B is as follows:

$$J_1 = \int_{\Gamma} (f\, n_1 - \sigma_{ij}\, n_j\, u_{i,1})\, ds \qquad (5.3)$$

Figure 26 shows that the integral along the path of the upper half-plane is equal to the sum of the individual line integrals. Therefore, due to symmetry

$$J_1 = 2 \left\{ \int_{A\,C}^{B} (f\, n_1 - \sigma_{ij}\, n_j\, u_{i,1})\, ds + \int_{E\,C_3} (f\, n_1 - \sigma_{ij}\, n_j\, u_{i,1})\, ds + \int_{C} (f\, n_1 - \quad{}_{ij}\, n_j\, u_{i,1})\, ds \right\} \qquad (5.4)$$

Herein, the normals and the arc lengths, for the paths of integration are

From A to B	$n_1 = 1$	$n_2 = 0$	$n_3 = 0$
	$ds = dx$	$dx_1 = 0$	
From B to C	$n_1 = 0$	$n_2 = 1$	$n_3 = 0$
	$ds = -dx$	$dx_2 = 0$	
from C to D	$n_1 = -1$	$n_2 = 0$	$n_3 = 0$
	$ds = -dx$	$dx_1 = 0$	

After expanding equation (5.4) and substituting the above values for the normal n, the following expression is obtained:

$$J_1 = 2 \left\{ \int_{A}^{B} (f - \sigma_{11} \epsilon_{11} - \sigma_{21} u_{2,1}) \, dx_2 + \int_{B}^{C} (\sigma_{12} \epsilon_{11} + \sigma_{22} u_{2,1}) \, dx_1 + \int_{C}^{C_3} (f - \sigma_{11} \epsilon_{11} - \sigma_{21} u_{2,1}) \, dx_2 \right\} \tag{5.5}$$

Using the same procedure, the following equation is derived for J when K=2 in equation (5.4). Therefore,

$$J_2 = -2 \left\{ \int_{A}^{B} (511 \, u_{1,2} + \sigma_{21} \epsilon_{22}) \, dx_2 + \int_{a}^{C_3} (f - \sigma_{12} u_{1,2} - \sigma_{22} \epsilon_{22}) \, dx_1 + \int_{C} (\sigma_{11} u_{1,2} + \sigma_{21} \epsilon_{22}) \, dx_2 \right\} \tag{5.6}$$

Equation (5.1) can be expressed,

$$M = \int x_1 (f n_1 - \sigma_{ij} n_j u_{i,1}) \, ds + \int x_2 (f n_2 - \sigma_{ij} n_j u_{i,2}) \, ds \tag{5.7}$$

This equation for M can be expressed and written as:

$$M = M_1 + M_2$$

where

$$M_1 = 2 \left\{ \int_{A}^{B} x_{1(AB)} (f - \sigma_{11} \epsilon_{11} - \sigma_{21} u_{2,1}) \, dx_2 + \int_{B}^{C} x_{1(BC)} (\sigma_{12} \epsilon_{11} + \sigma_{22} u_{2,1}) \, dx_1 + x_{1(CC_3)} (f - \sigma_{11} \epsilon_{11} - \sigma_{21} u_{2,1}) \, dx_2 \right\}$$

and

$$M_2 = 2 \left\{ \int_A^B x_{2(AB)} \left(\sigma_{11} u_{1,2} + \sigma_{21} \epsilon_{22} \right) dx_2 + \int_B^C x_{2(BC)} \left(f - \sigma_{12} u_{1,2} - \sigma_{22} \epsilon_{22} \right) dx_1 + x_{2(CC_3)} \left(\sigma_{11} u_{1,2} + \sigma_{21} \epsilon_{22} \right) dx_2 \right\} \quad (5.9)$$

5.4 Derivation of Formula for J and M-Integrals Using Isoparametric Elements

In this study, the following Rice formula is used to derive the M formula by employing isoparametric elements

$$J = \int \left(U dy - t \frac{\partial d}{\partial x} ds \right) \quad (5.10)$$

is tne strain energy density, t is the traction vector on a plane defined by tne outward drawn normal n, d is tne displacement vector, and ds is tne element of arc along the path Γ. The path can be conveniently chosen to coincide with the line $\xi = \xi_P$ = constant.

The elemental arc length along the line $\xi = \xi_P$ is given by

$$ds = \sqrt{dx^2 + dy^2} = \sqrt{\left(\frac{\partial x}{\partial \eta} \right)^2 + \left(\frac{\partial y}{\partial \eta} \right)^2} \, d\eta \quad (5.11)$$

and similarly

$$dy = \frac{\partial y}{\partial \eta} d\eta \quad (5.12)$$

Tne strain energy density for plane problem can be written

$$U = \frac{1}{2} \left(\sigma_{xx} \epsilon_{xx} + 2 \sigma_{xy} \epsilon_{xy} + \sigma_{yy} \epsilon_{yy} \right) \quad (5.13)$$

Also the traction vector is

$$t = \begin{Bmatrix} \sigma_{xx} \eta_1 + \sigma_{xy} \eta_2 \\ \sigma_{xy} \eta_1 + \sigma_{yy} \eta_2 \end{Bmatrix} \quad (5.14)$$

so tnat

$$t\frac{\partial d}{\partial x} = \left(\sigma_{xx}\eta_1 + \sigma_{xy}\eta_2\right)\frac{\partial u}{\partial x} + \left(\sigma_{xy}\eta_1 + \sigma_{yy}\eta_2\right)\frac{\partial v}{\partial x} \quad (5.15)$$

The following expression [6] Is obtained by substituting equations (5.11), (5.12), (5.13), and (5.15) in equation (5.10)

$$J^{(e)} = \int_{-1}^{+1}\left\{\frac{1}{2}\left[\sigma_{xx}\frac{\partial u}{\partial x} + \sigma_{xy}\left(\frac{\partial u}{\partial y} + \frac{\partial v}{\partial x}\right) + \sigma_{yy}\frac{\partial v}{\partial y}\right]\frac{\partial y}{\partial \eta} - \left[\left(\sigma_{xx}\eta_1 + \sigma_{xy}\eta_2\right)\frac{\partial u}{\partial x} + \left(\sigma_{xy}\eta_1 + \sigma_{yy}\eta_2\right)\frac{\partial u}{\partial x}\right]\sqrt{\left(\frac{\partial x}{\partial \eta}\right)^2 + \left(\frac{\partial y}{\partial \eta}\right)^2}\right\} d\eta = \int_{-1}^{+1} I \, d\eta \quad (5.16)$$

Equation (5.16) gives the contribution to the J-integral from an individual element. The integrand I in (5.16) is evaluated at the Gaussian sampling points (ξ_p, η_q) for the elements as follow:

$$J^{(e)} = \sum_{q=1}^{NGAUS} I\left(\xi_p, \eta_q\right) W_q \quad (5.17)$$

w_q is the weighting factor corresponding to η_q. The Cartesian derivatives of the displacement components required in (5.16) are given by

$$\frac{\partial(u,v)}{\partial x} = \sum_{i=1}^{n} \frac{\partial N_i^{(e)}}{\partial x}\left(u_i, v_i\right) \quad (5.18)$$

$$\frac{\partial(u,v)}{\partial y} = \sum_{i=1}^{n} \frac{\partial N_i^{(e)}}{\partial y}\left(u_i, v_i\right) \quad (5.19)$$

u_i and v_i are the displacement components of the n nodes of the element. And the Cartesian derivatives of the element shape functions are given by

$$\frac{\partial N_i^{(e)}}{\partial x} = \frac{\partial N_i^{(e)}}{\partial \xi}\cdot\frac{\partial \xi}{\partial x} + \frac{\partial N_i^{(e)}}{\partial \eta}\cdot\frac{\partial \eta}{\partial x} \quad (5.20)$$

$$\frac{\partial N_i^{(e)}}{\partial y} = \frac{\partial N_i^{(e)}}{\partial \eta} \cdot \frac{\partial \eta}{\partial y} + \frac{\partial N_i^{(e)}}{\partial \xi} \cdot \frac{\partial \xi}{\partial y} \qquad (5.21)$$

The terms $\partial\xi/\partial x$, $\partial\eta/\partial x$, $\partial\eta/\partial y$ and $\partial\xi/\partial y$ may be obtainea from tne inverse of tne Jacobian matrix. The M-integral can be expressed as follow:

$$M^{(e)} = \int_{-1}^{+1} x_i I \, d\eta \; ; \qquad i = 1,2 \qquad (5.22)$$

In an isoparametric representation, we may use tne equation (2.13) for xi. Tnerefore,

$$M^{(e)} = \sum_{i=1}^{r} \sum_{q=1}^{NGAUS} I(\xi_p, \eta_q) W_q \begin{bmatrix} N_i^{(e)} & 0 \\ 0 & N_i^{(e)} \end{bmatrix} \begin{Bmatrix} x_i^{(e)} \\ y_i^{(e)} \end{Bmatrix} \qquad (5.23)$$

r is tne number of nodes in eacn element e and N_i is tne matrix of shape functions calculated according to equations (2.11) and (2.12).

5.5 Results and Data Analysis

In tnis Investigation tne J- and M-integrals nave been calculated by employing tne formulas derived in section 5.3 To minimize the amount of calculation and tnerefore to maximize tne accuracy, patn 2-A and patn 2-8 (Figure 26) nave been cnosen. Figure 26 snows tne patns passing tnrough tne integration points.

Appendix A snows tne stresses and strains at the integration points for patns 2-A and 2-8 (Figure 26) of tne plate. The stresses and strains are obtained from tne FE analysis in Chapter III wnen a/w=0.4 and σ =2.9 N/mm^2. Location of tne integration points in tne global system are computed (Figure 27) by employing tne equations (2.11), (2.12), and (2.73). Equation (2.2) is used to calculate $u_{i,1}$ and $u_{i,2}$ for eacn integration point along tne paths (Figure 26).

The calculated results in appendix A are usea to obtain tne J_K (K=1,2) and M values for botn patns. The deviations between tne J values obtained from botn patns and tne numerical calculation are witnin 10% error [Table 11]. However, patn 2-A gives a value closer to tne numerically obtained FE value (2% error). And tne M values calculated from patns 2-A and 2-B are witnin 7% difference. These values of M are compared with tne values obtained by tne formula given below [21]

$$M = \alpha J [(1/2)(\ell + w)] \qquad (5.24)$$

in wnicn ℓ and w are tne length and width of tne plastic zone respectively and α is a coefficient wnicn is approximatea as equal to M/J. This ratio is always less tnan one. Table 12 snows tne comparison of M values between theoretical ana numerical calculation. As it can be seen, tne magnitiude of α is less than one and tne values of M differ slightly.

Conclusions

The J-integral values were determined by changing the crack length in the finite element grid for the edge notch specimen. A review of analysis of these various finite element (FE) modelings suggests that accurate results are obtained with collapsed isoparametric elements containing quarter nodes near the crack tip. Furthermore, the collapsed elements reduce the need for a large number of elements in the region near the crack tip.

comparison of the J-integral values obtained, through the integration of eight different paths, shows that the J-integral is path independent (Figure 16) even if a flow theory of plasticity is used (2.21).

Comparison was made between the experimentally measured load-displacement and the load-displacement obtained from the FE analysis(Figure 18). The results were close to each other in the elastic range but the deviation increased above tne elastic range. In addition, a comparison was made between the J values from tne elastic-plastic FE method and tne approximate methods (Table 10). The numerically determined J value was within 5% with those Obtained from estimation techniques. The nigher deviation found may be due to a smaller crack length a/w = 0.2, which is close to the edge notch. The estimation load-displacement curve provides better result than the stiffness gradient method.

The numerically determined M-values for two different paths were computed manually and they were compared with the estimated value [Table 12]. It was found that the coefficient α is smaller than one for both paths and the M-values have an error of 8.2%.

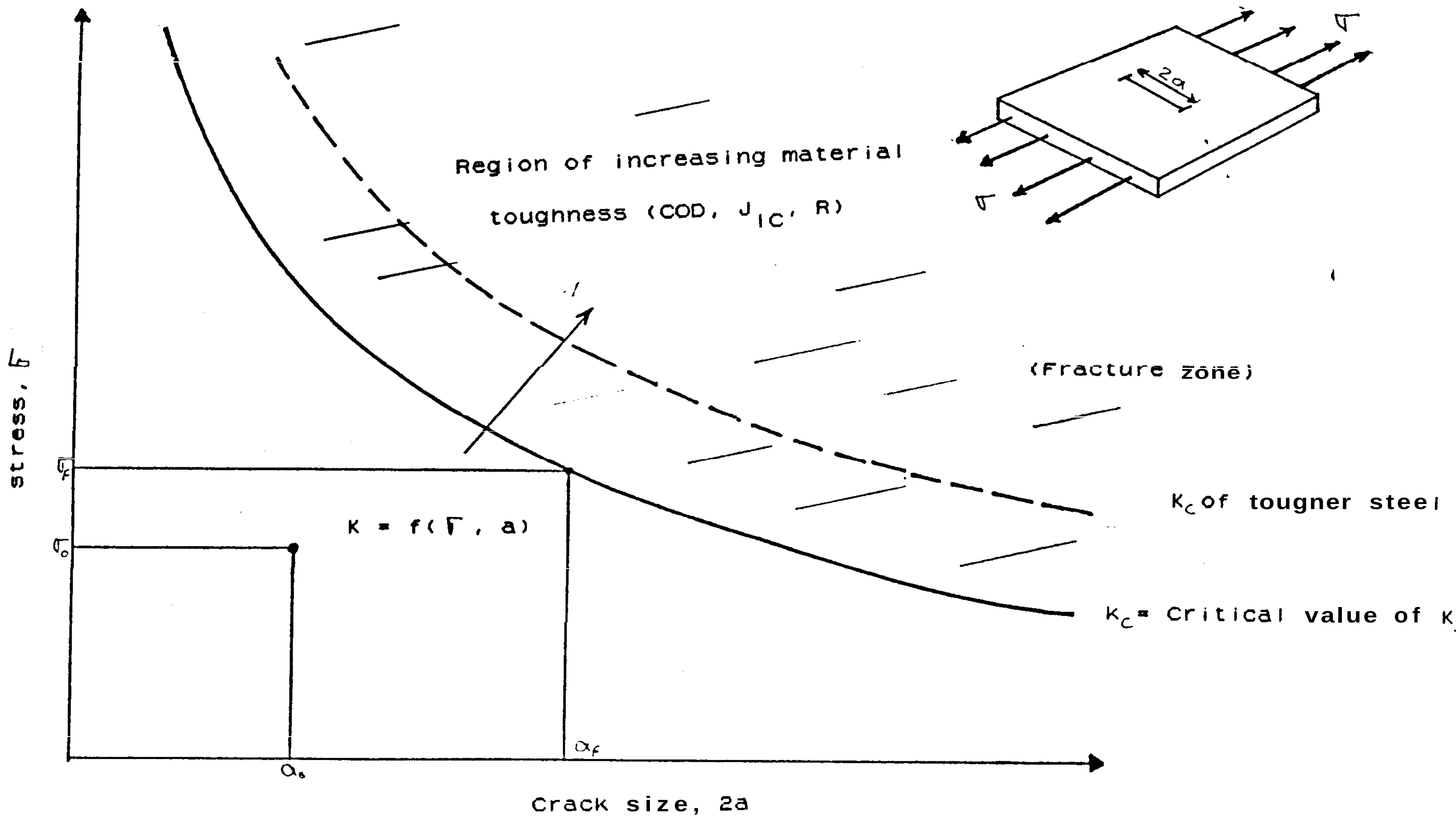


Figure 1. Schematic relation between stress, flaw size and material tougnness

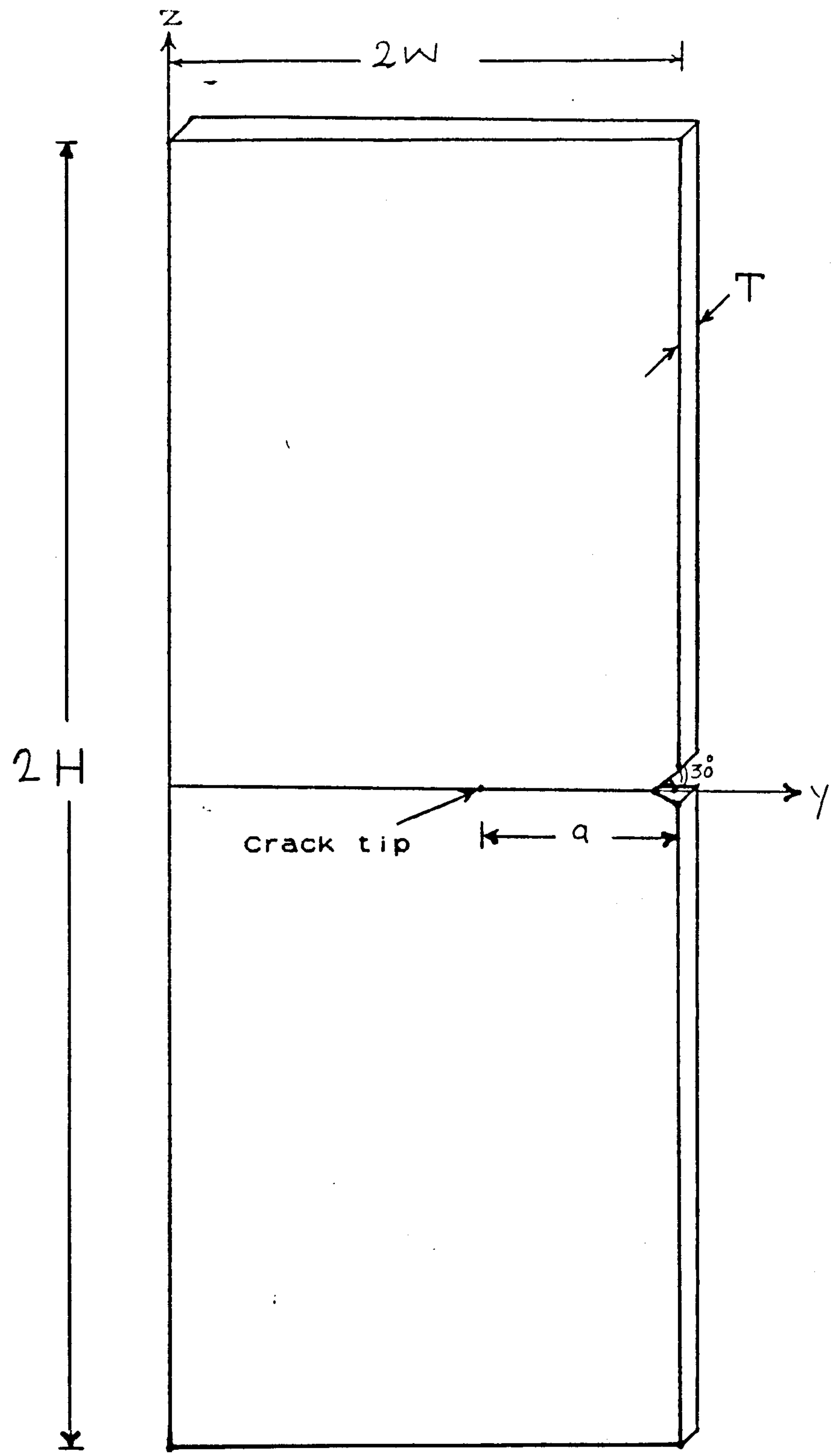
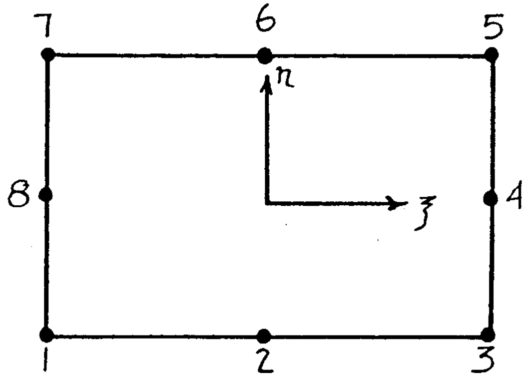
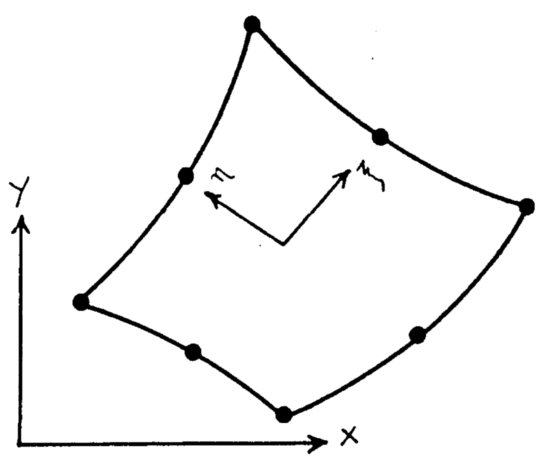


Figure 2. Edge notcn crack specimen



Parent element



Global element

Local node number	ξ_i	η_i
1	-1	-1
2	0	-1
3	1	-1
4	1	0
5	1	1
6	0	1
7	-1	1
8	-1	0

Figure 3. The node numbering and local coordinates of the nodes for an eight nodes isoparametric element

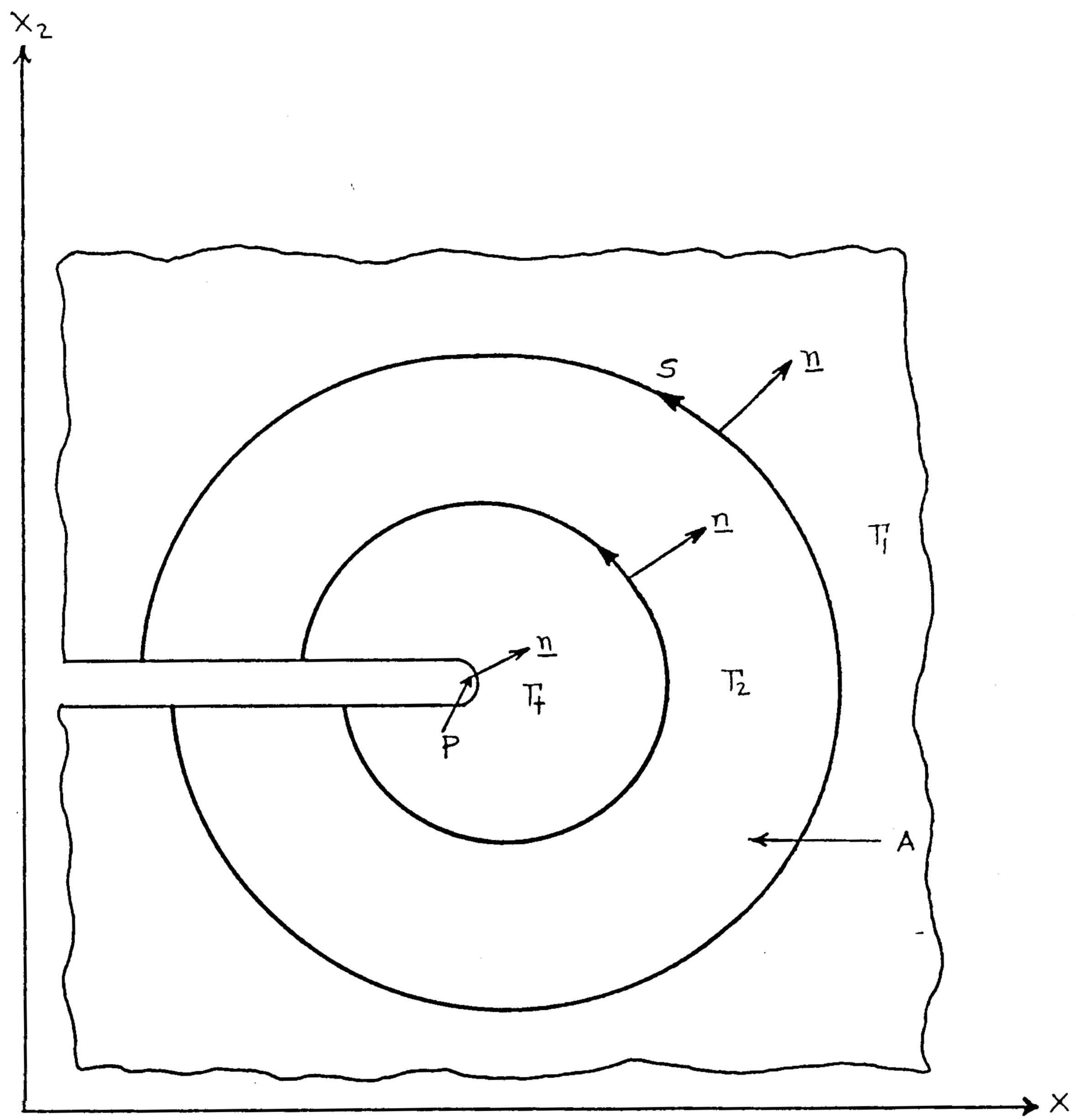
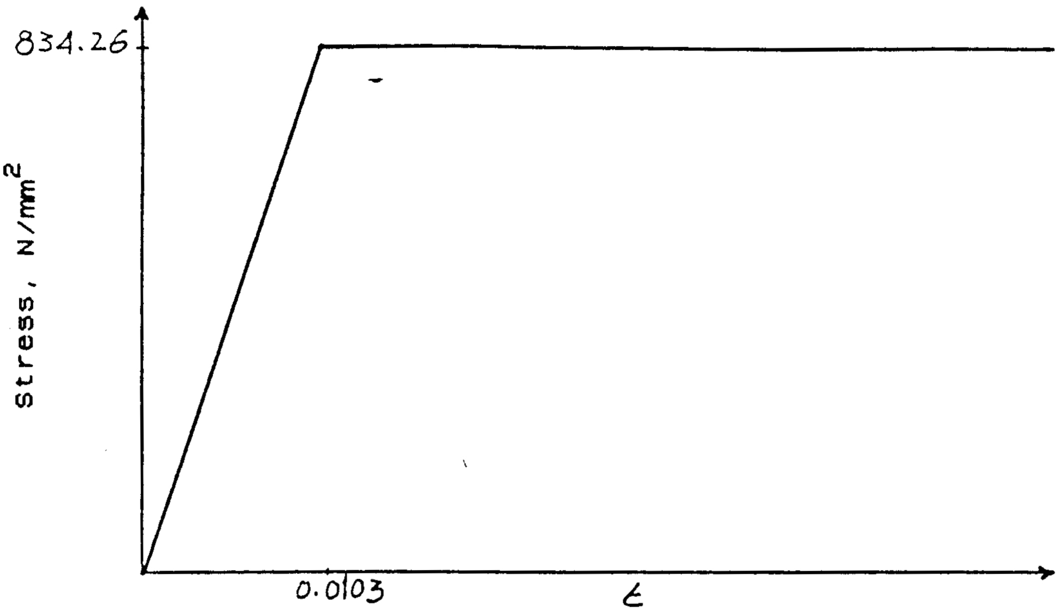
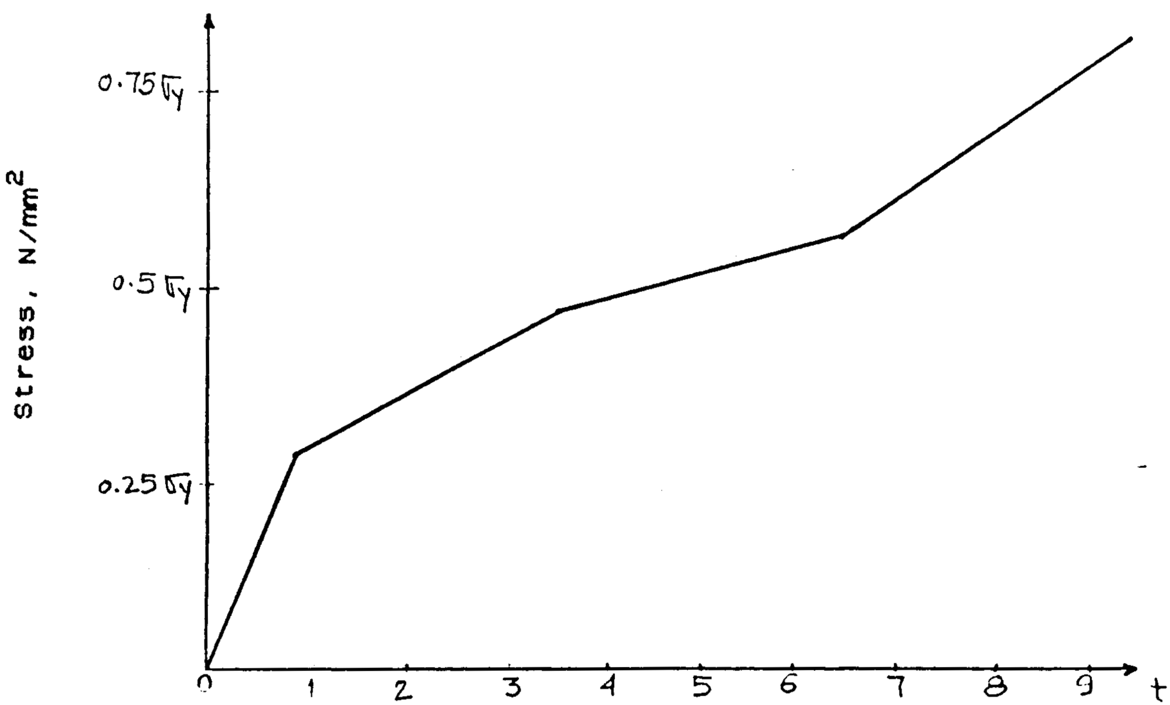


Figure 4. Contours surrounding the notch in a two dimensional body



a). Idealized stress-strain relation



b). Load curve for controlled stress

Figure 5. Stress-strain relation and load curve for tne steel specimen

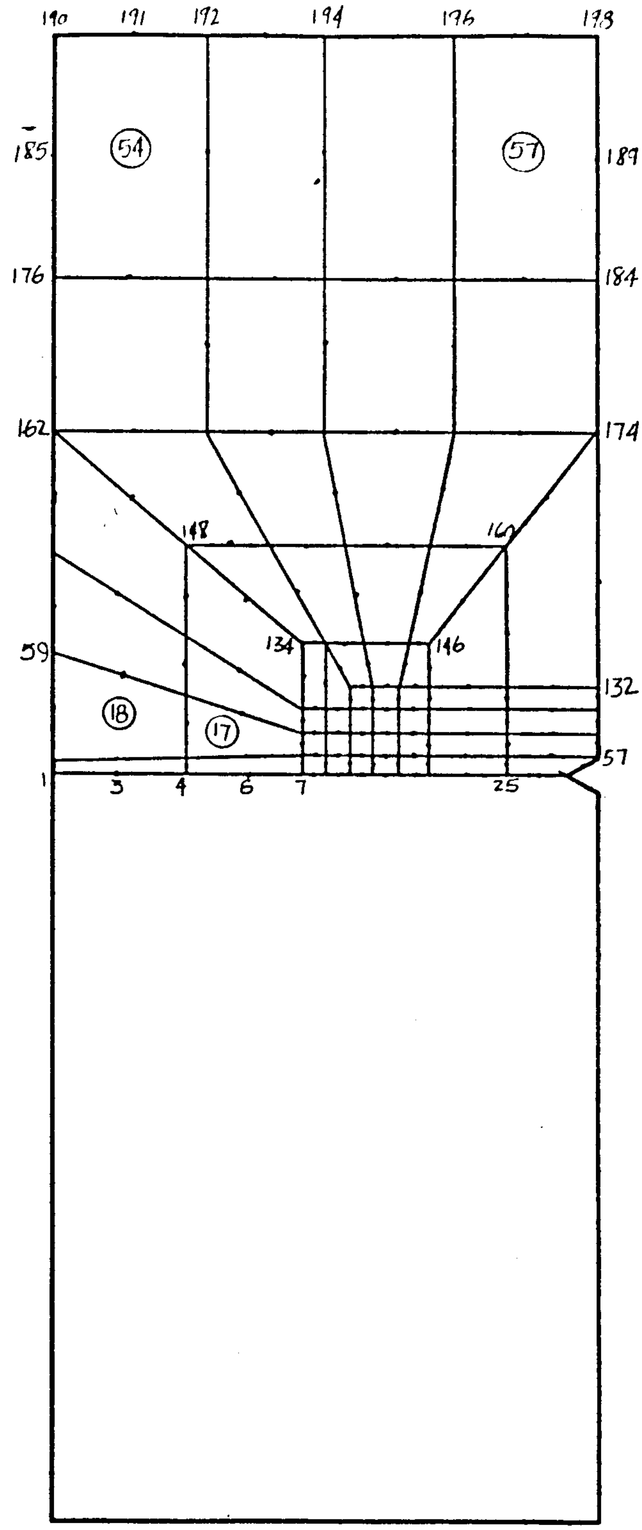


Figure 6. Finite element grid Mesh1, M1

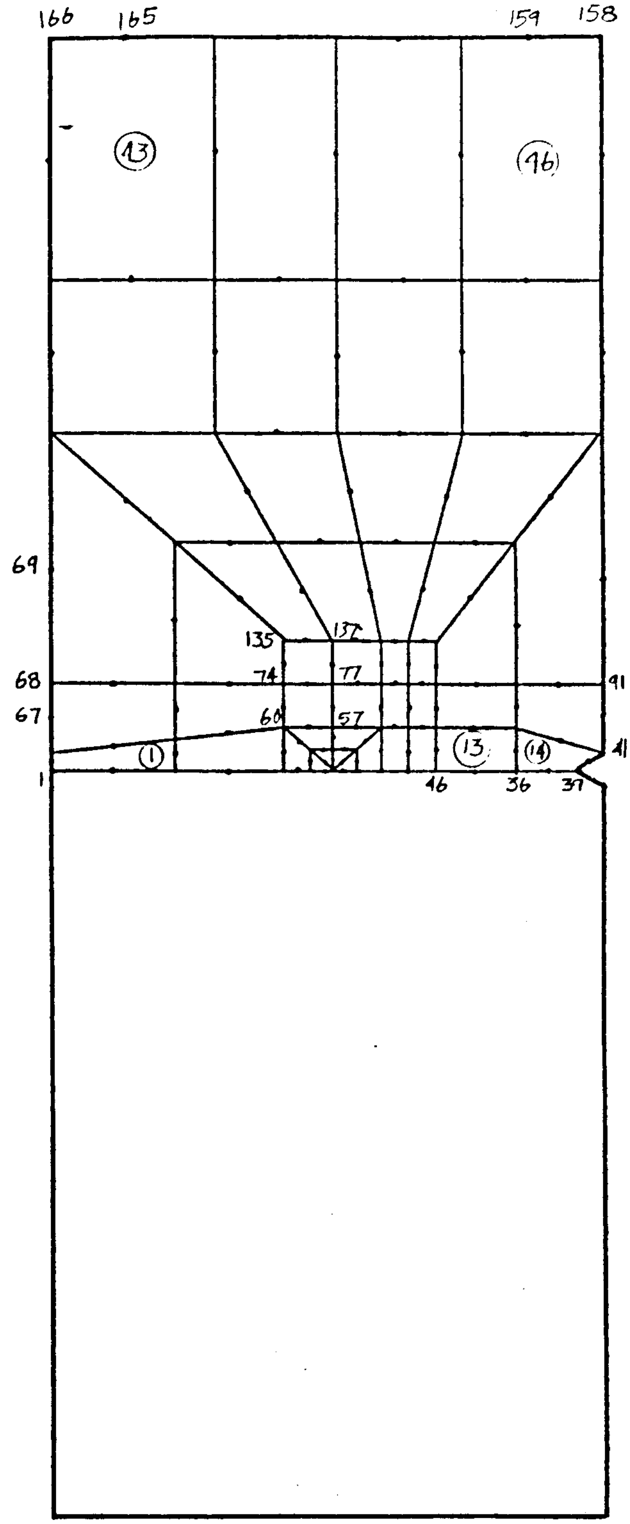


Figure 7. Finite element grid Mesh2

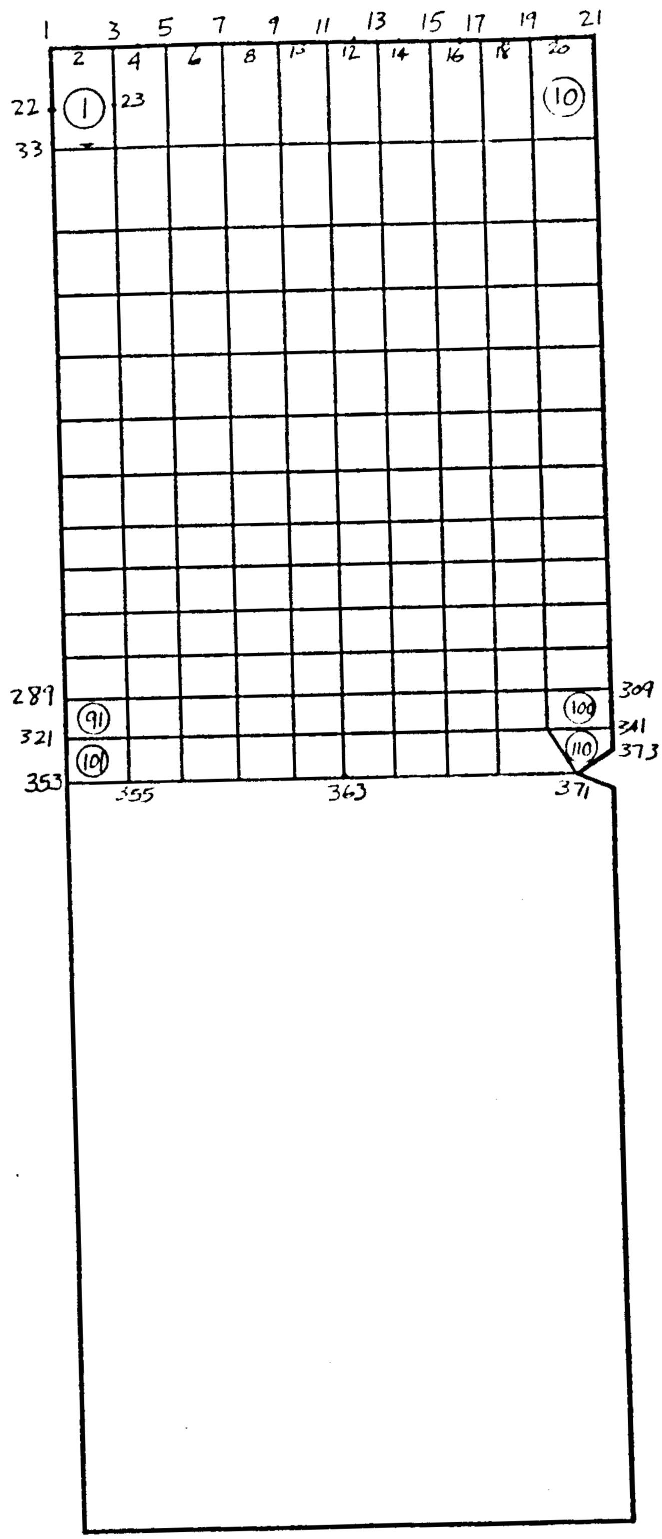


Figure 8. Finite element grid Mesh3, M3

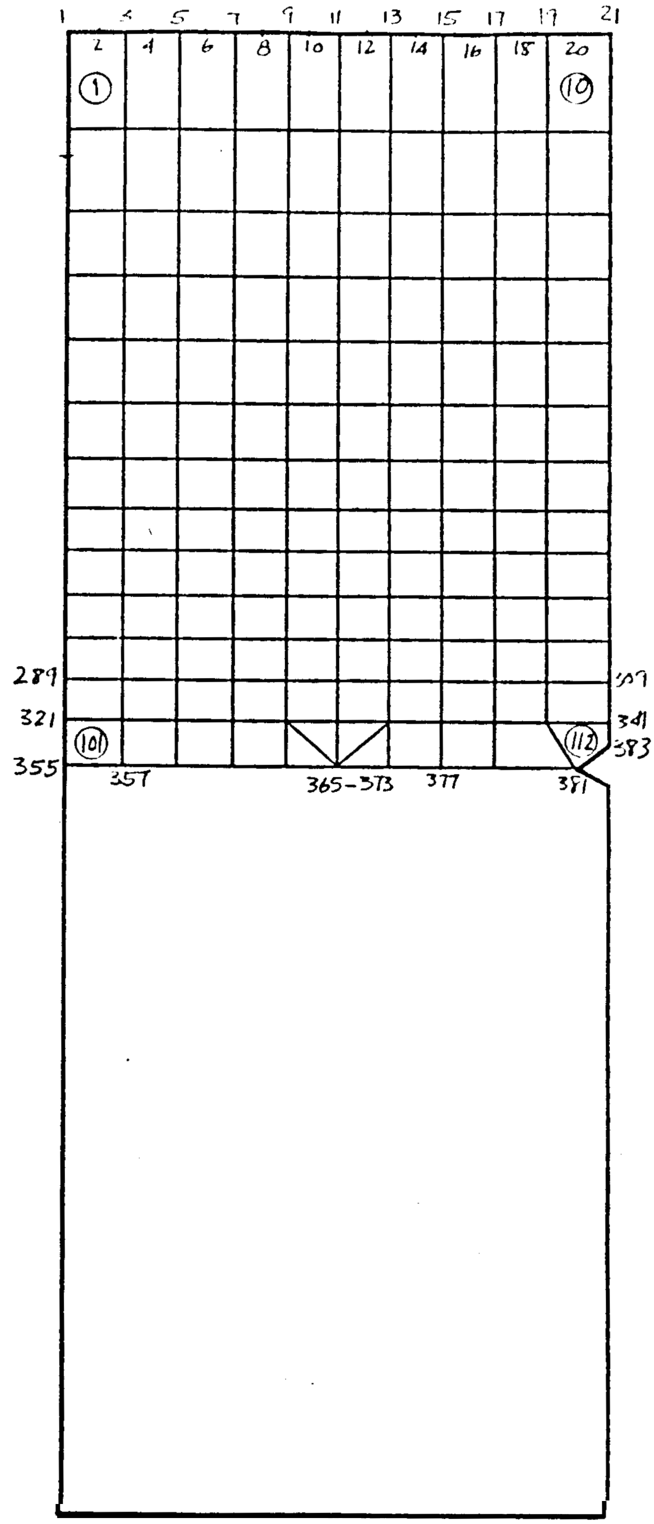


Figure 9. Finite element grid Mesh4, M4

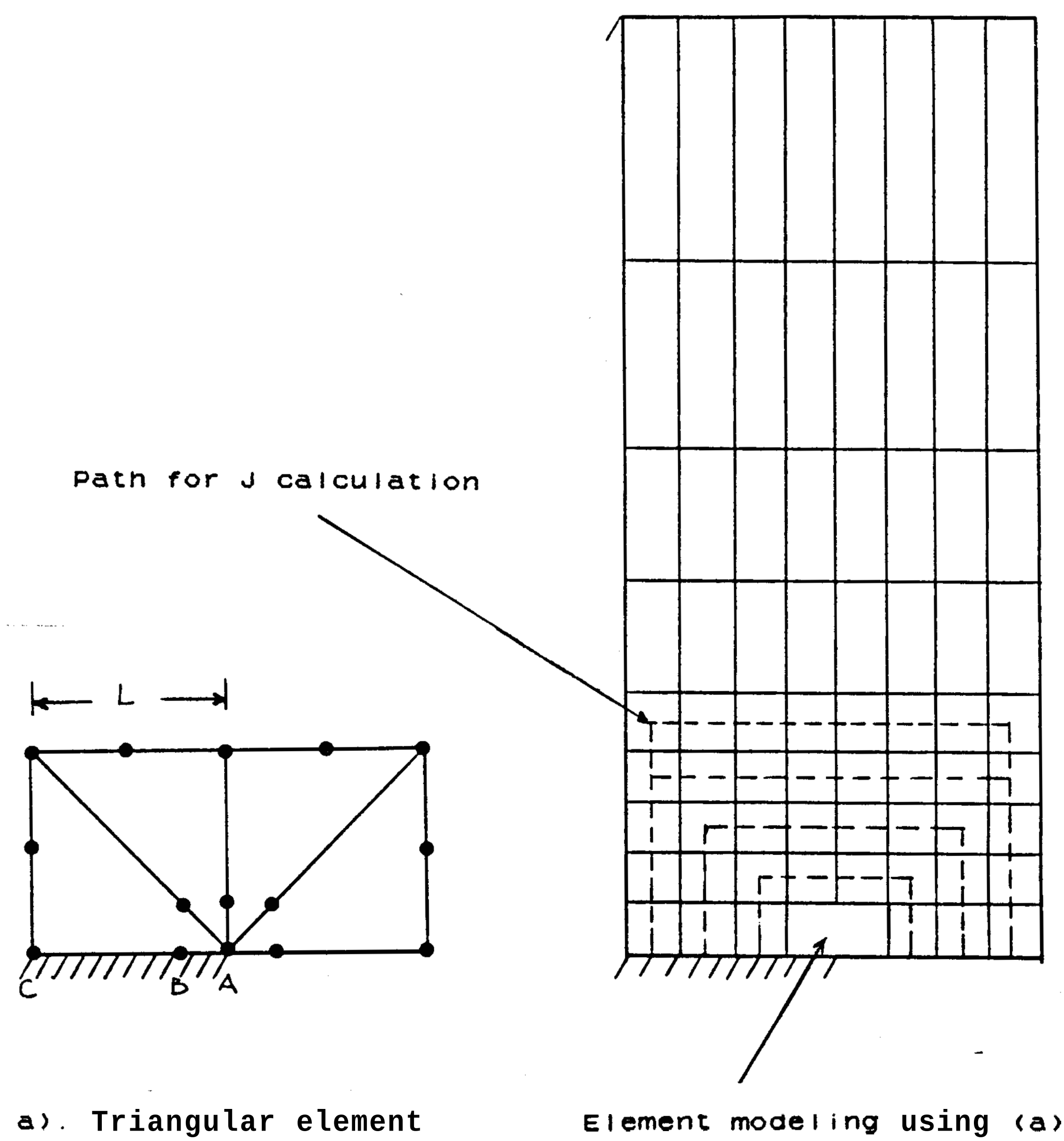


Figure 10. Crack modeling witn quadratic isoparametric element

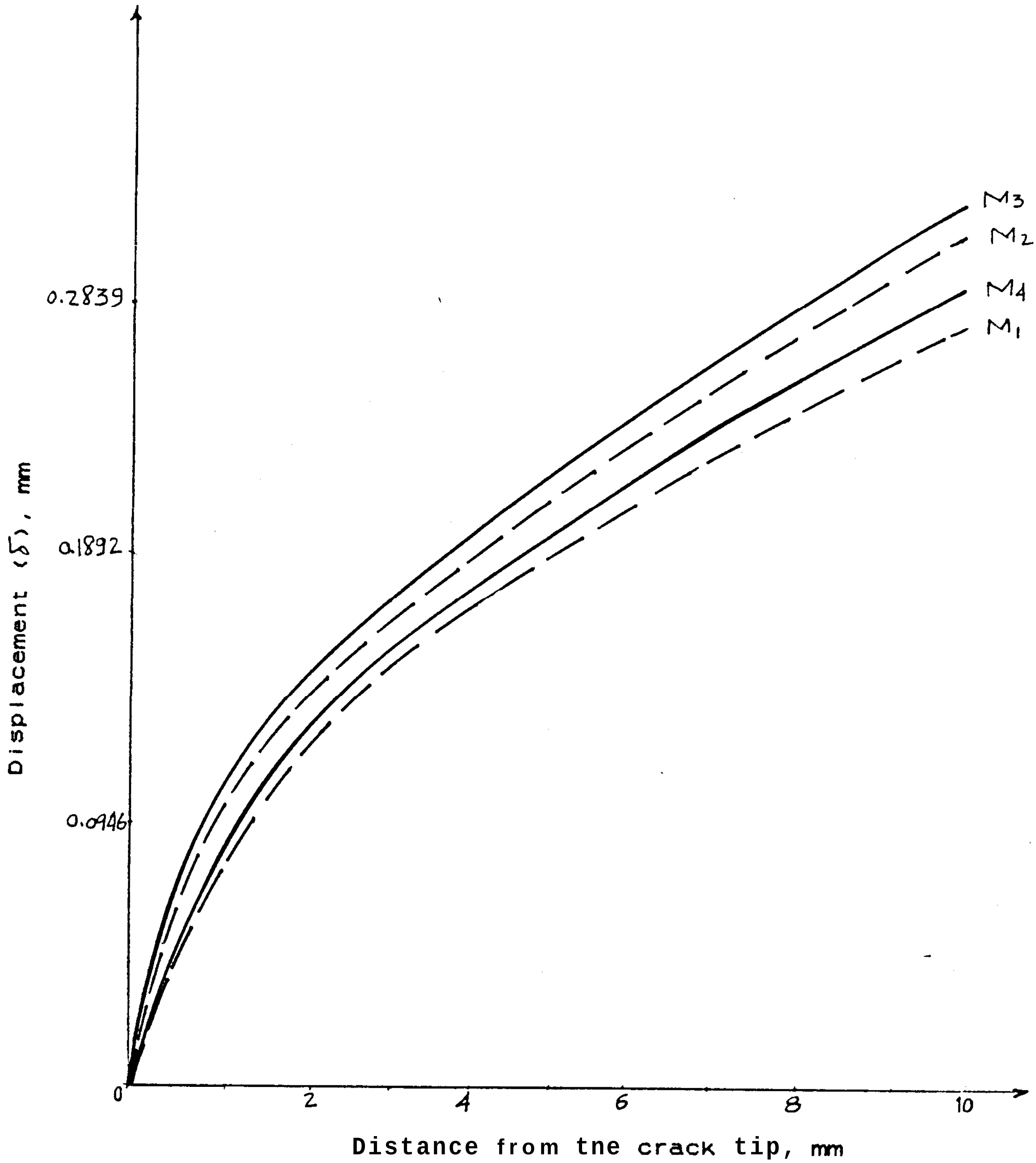


Figure 11. Crack opening displacements for tne different FE meshes

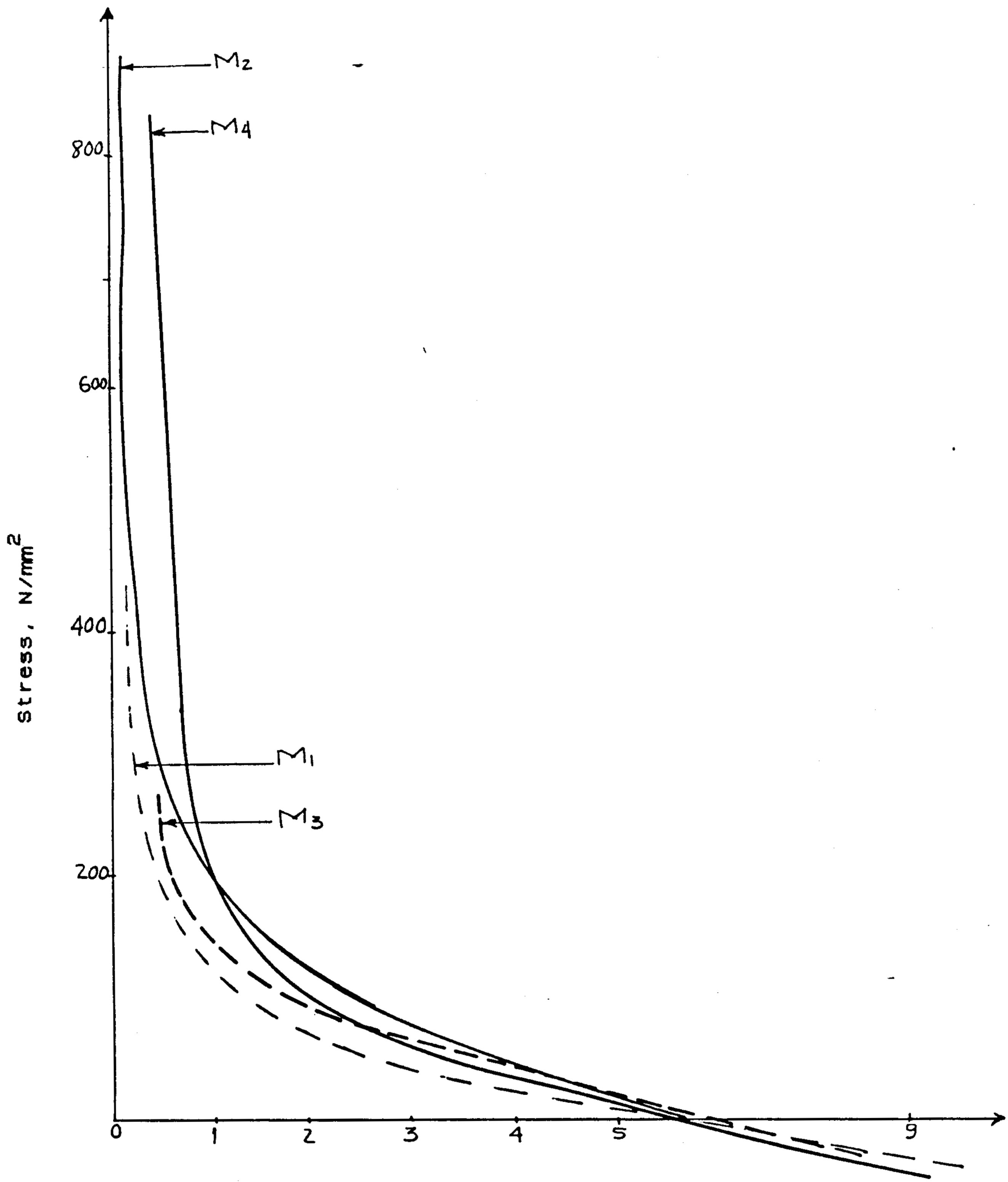
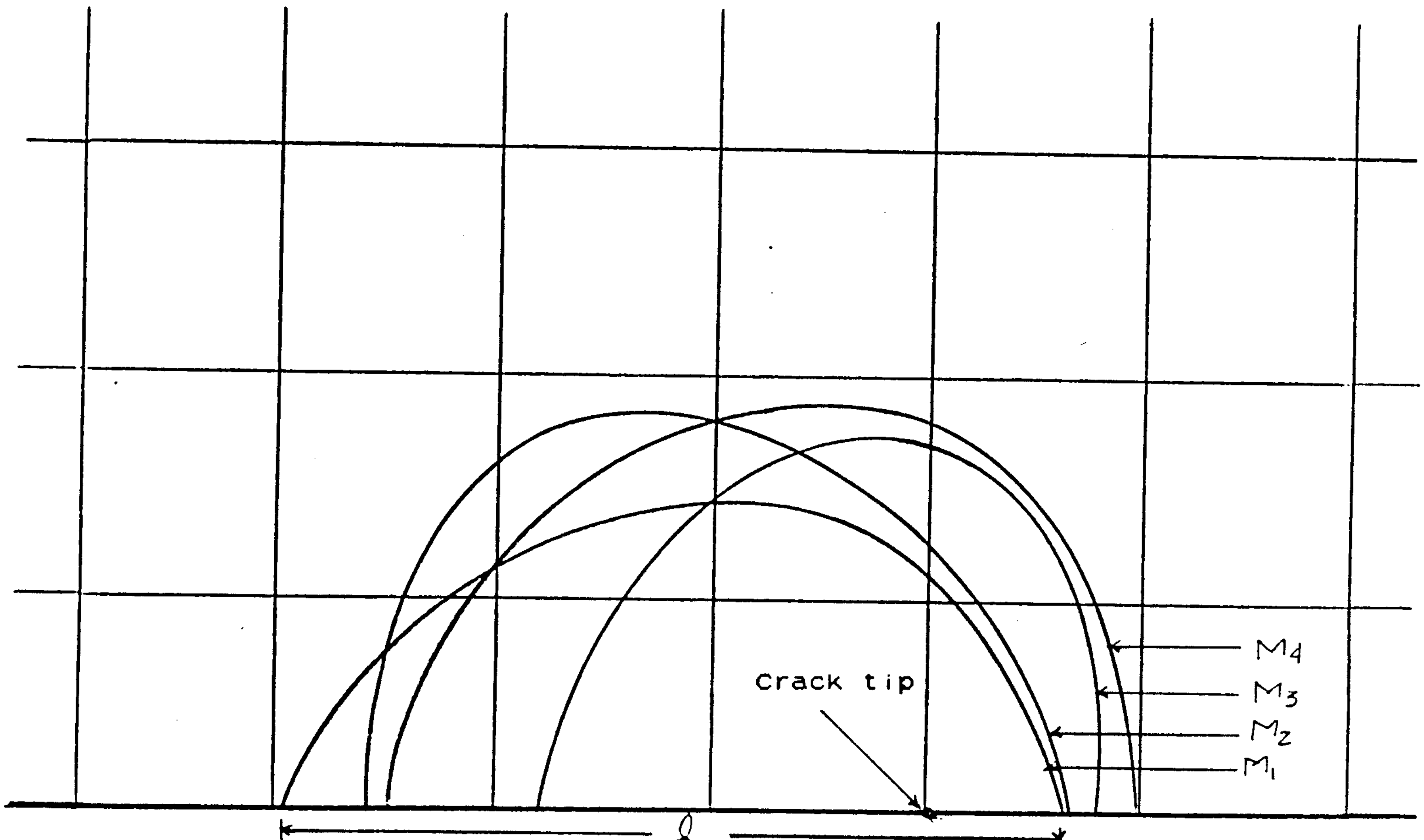


Figure 12. Stress vs. distance from the crack tip for different FE mesnes



ℓ = Length of the plastic zone for the M1 curve

Figure 13. Plastic zone growths for grids M1, M2, M3 and M4

($a/w=0.5$, $\sigma/\sigma_y=0.2$)

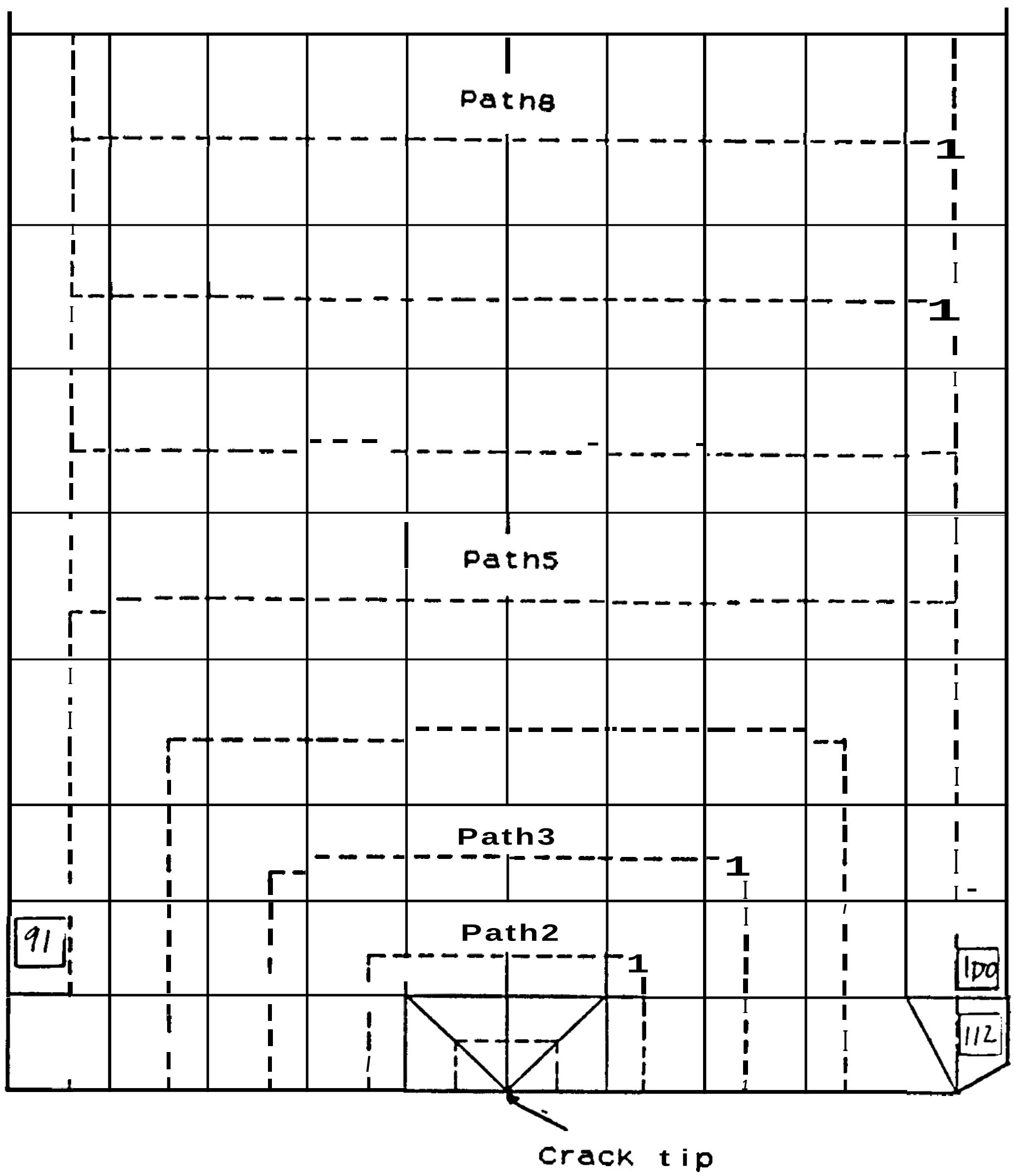


Figure 14. Integration paths for J-integral evaluation

a/w = 0.5

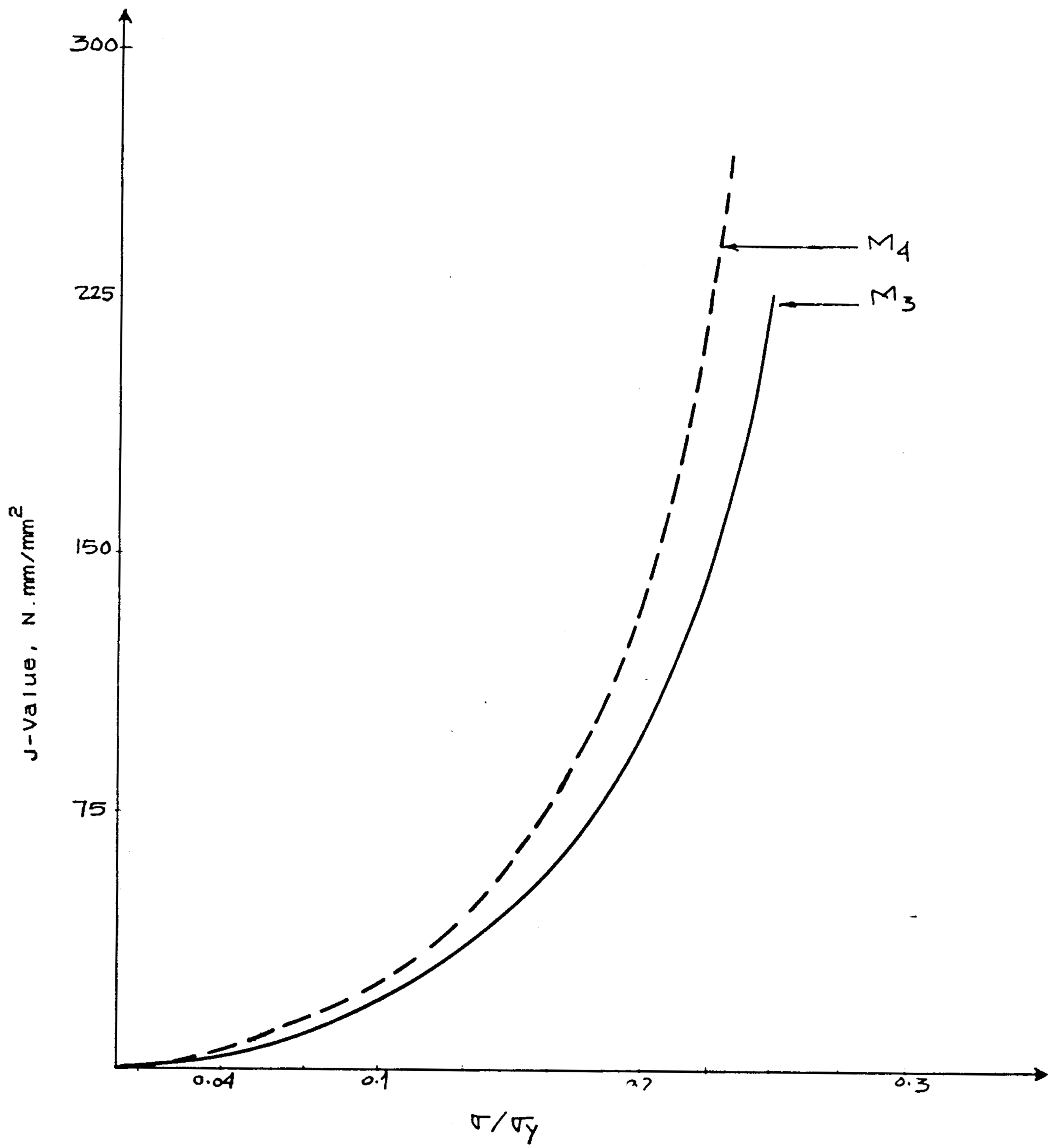


Figure 15. A comparison of J-values between FE mesnes M3, M4

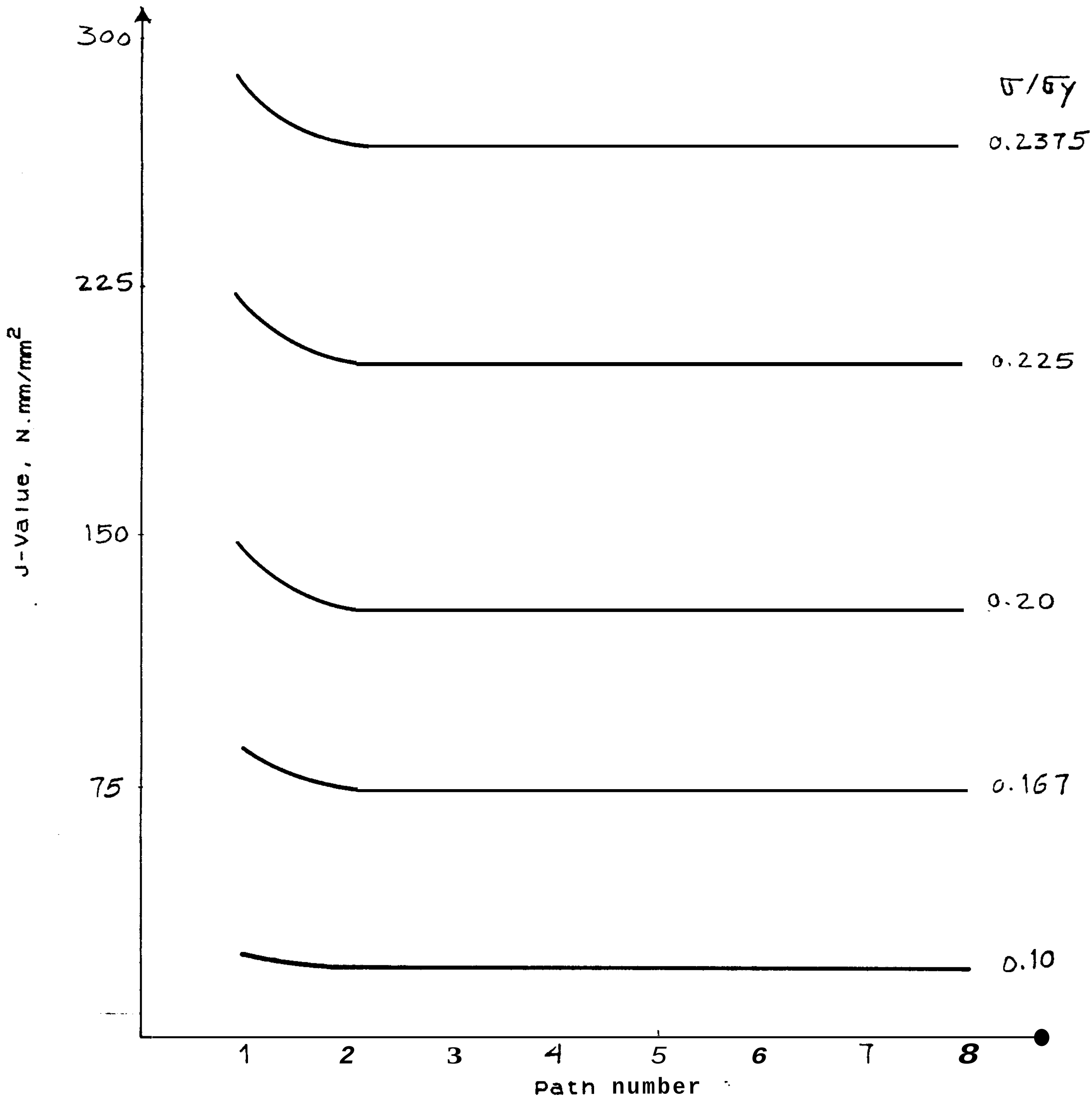
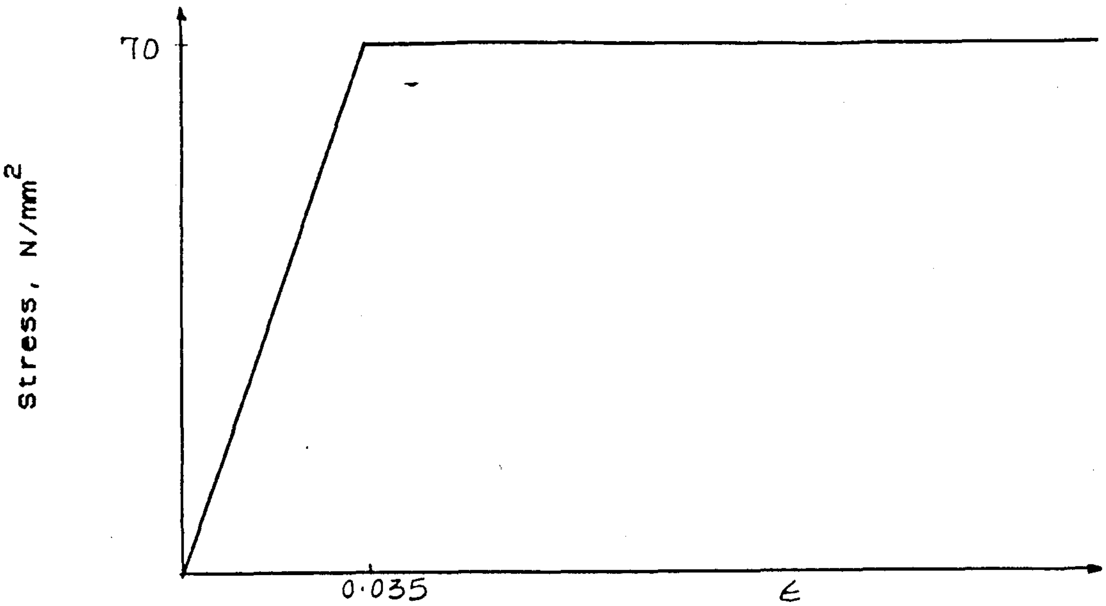
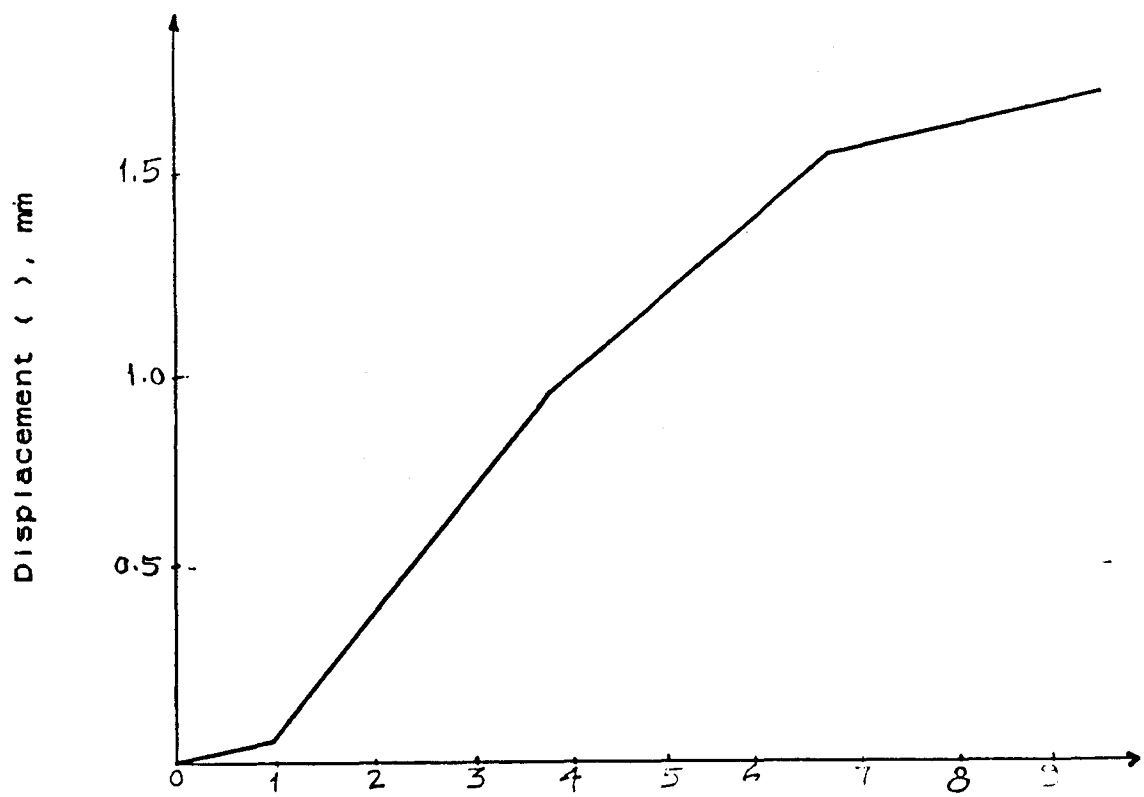


Figure 16. Path independence of J-integral



a). Idealized Stress-strain relation



b). Load curve for controlled displacement

Figure 17. Stress-strain relation and load curve for the polycarbonate specimen

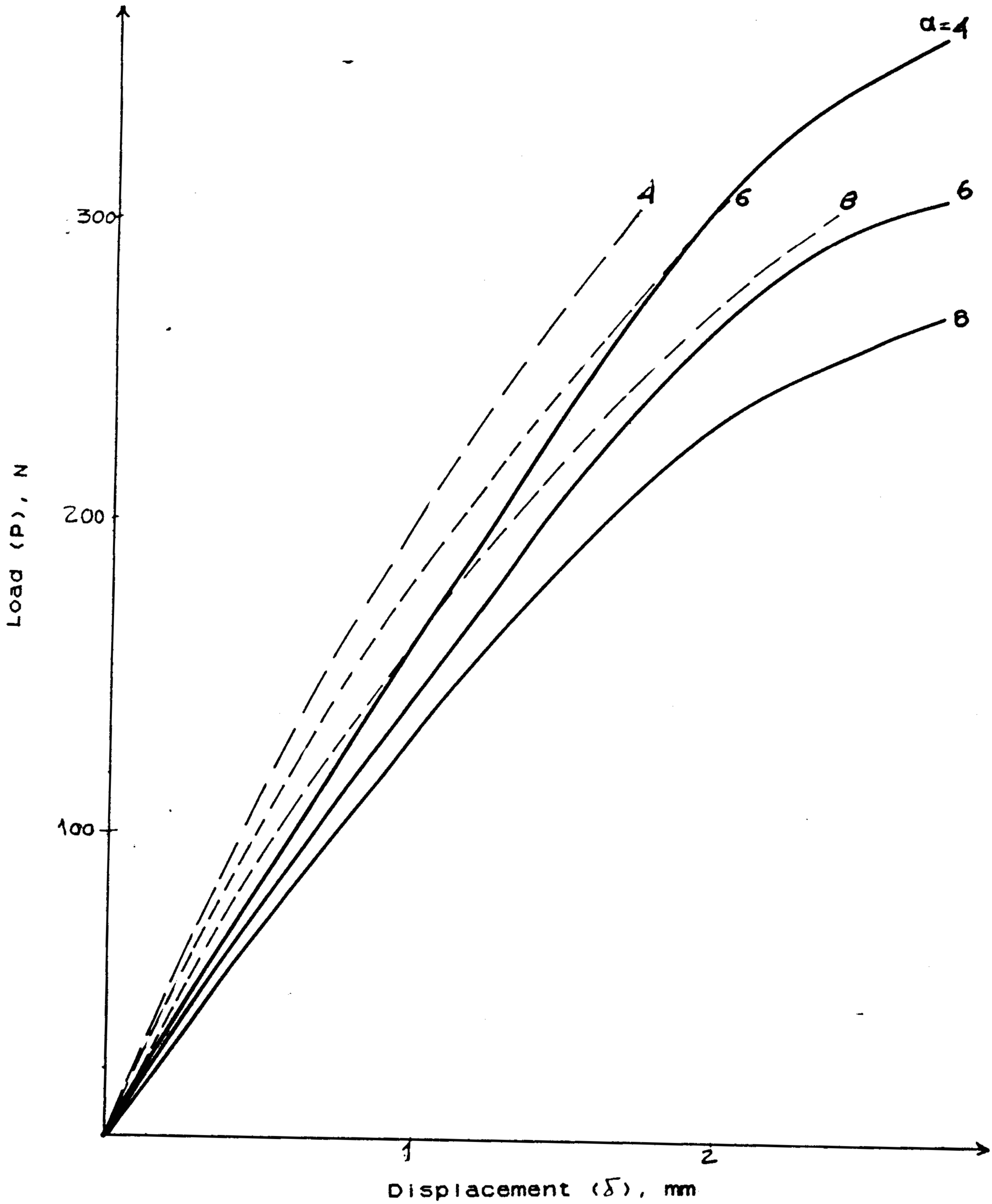


Figure 18. comparison between the experimentally measured load-displacement (---) and FE analysis (——)

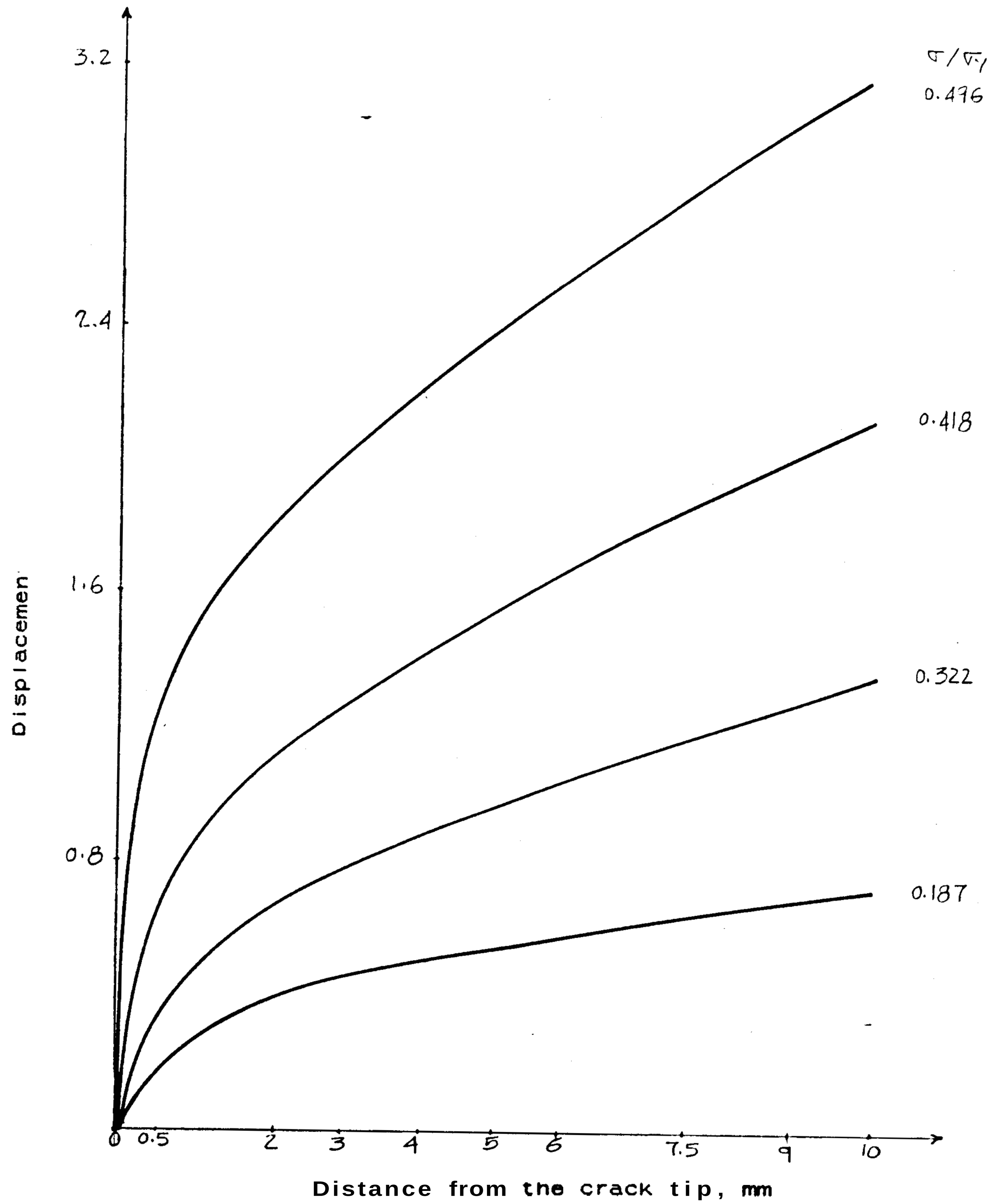


Figure 19. Crack opening oisplacements for various stress levels

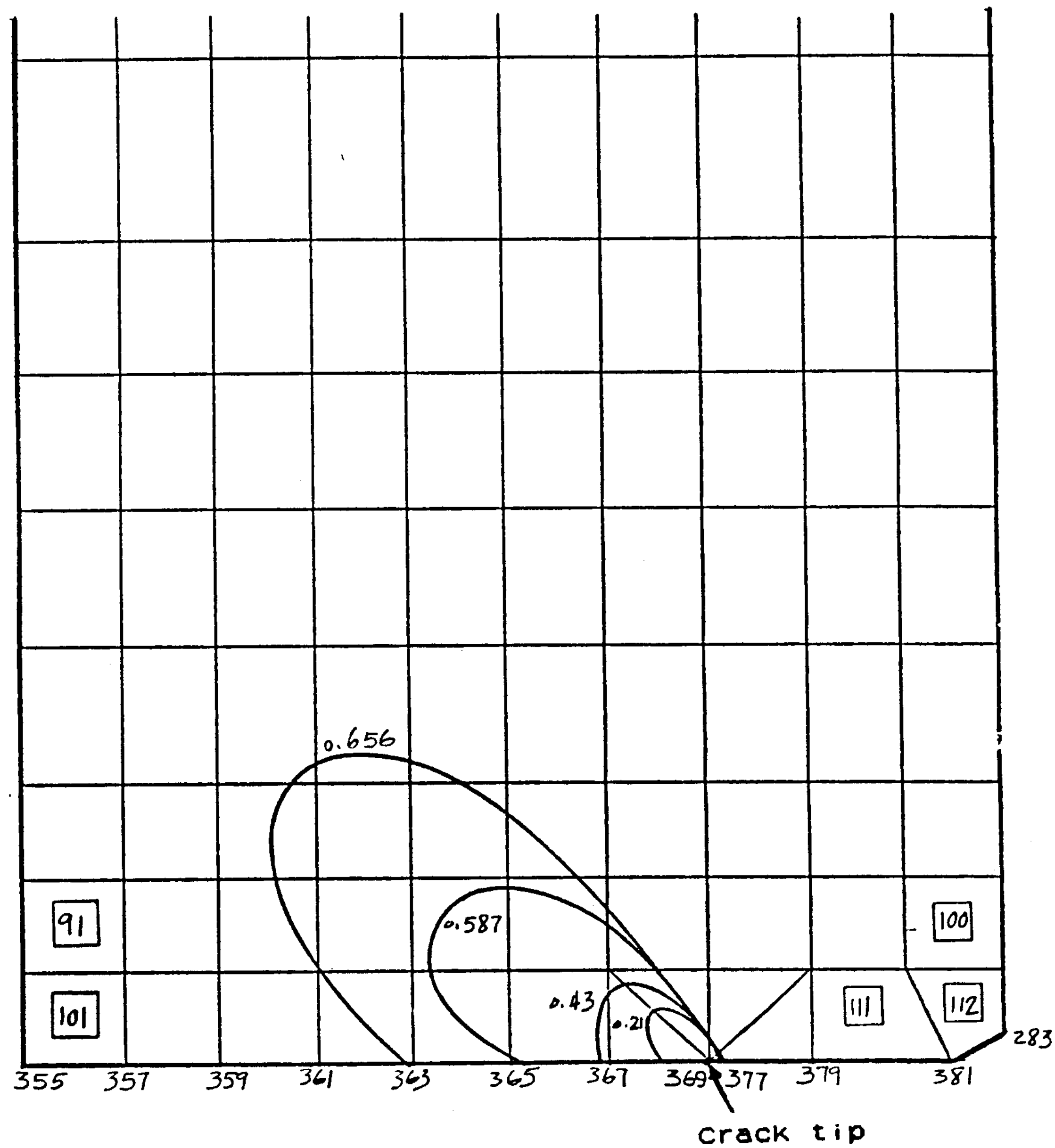


Figure 20. Plastic zone growth for a/w = 0.3

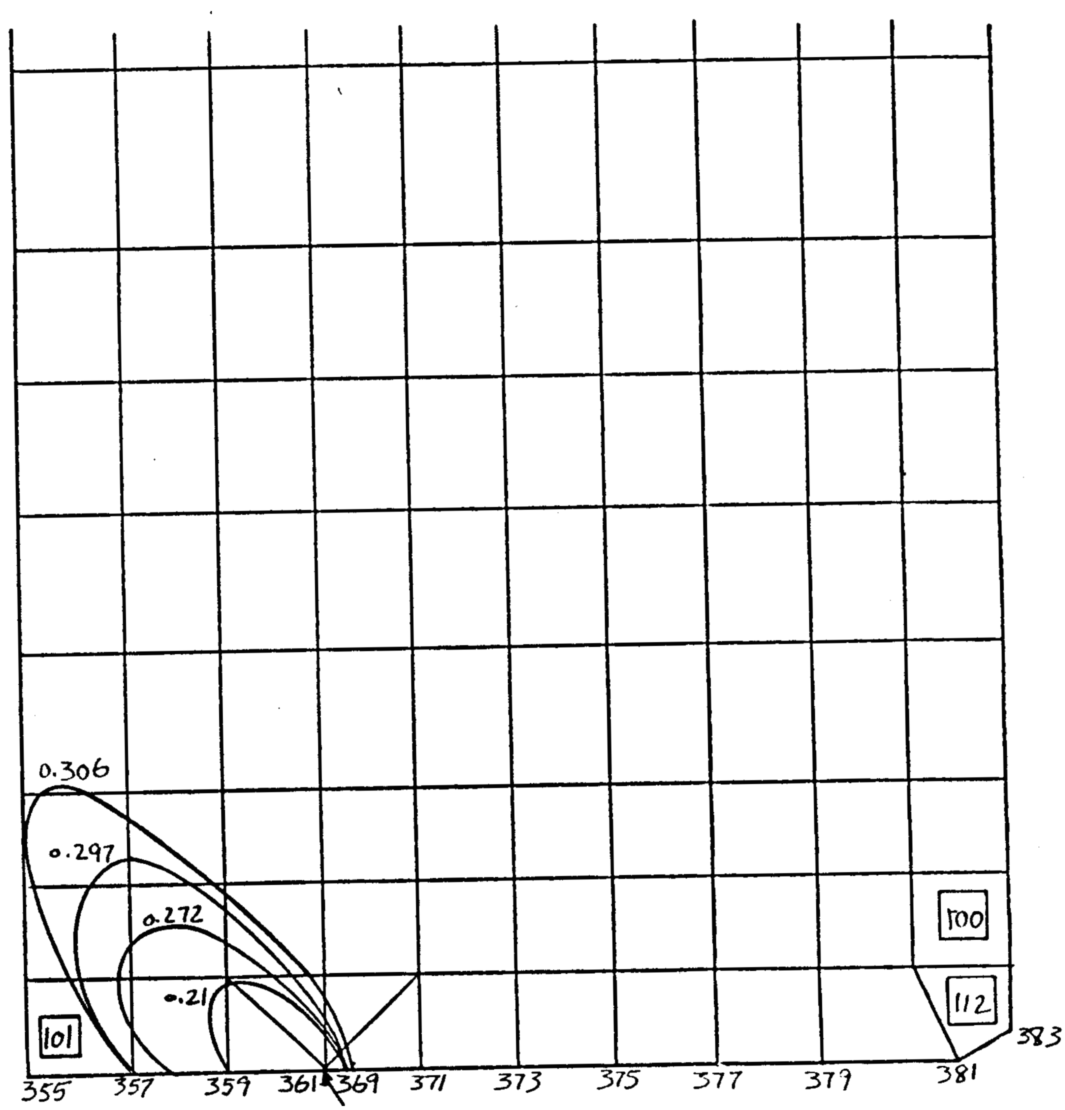


Figure 21. Plastic zone growth for a/W = 0.7

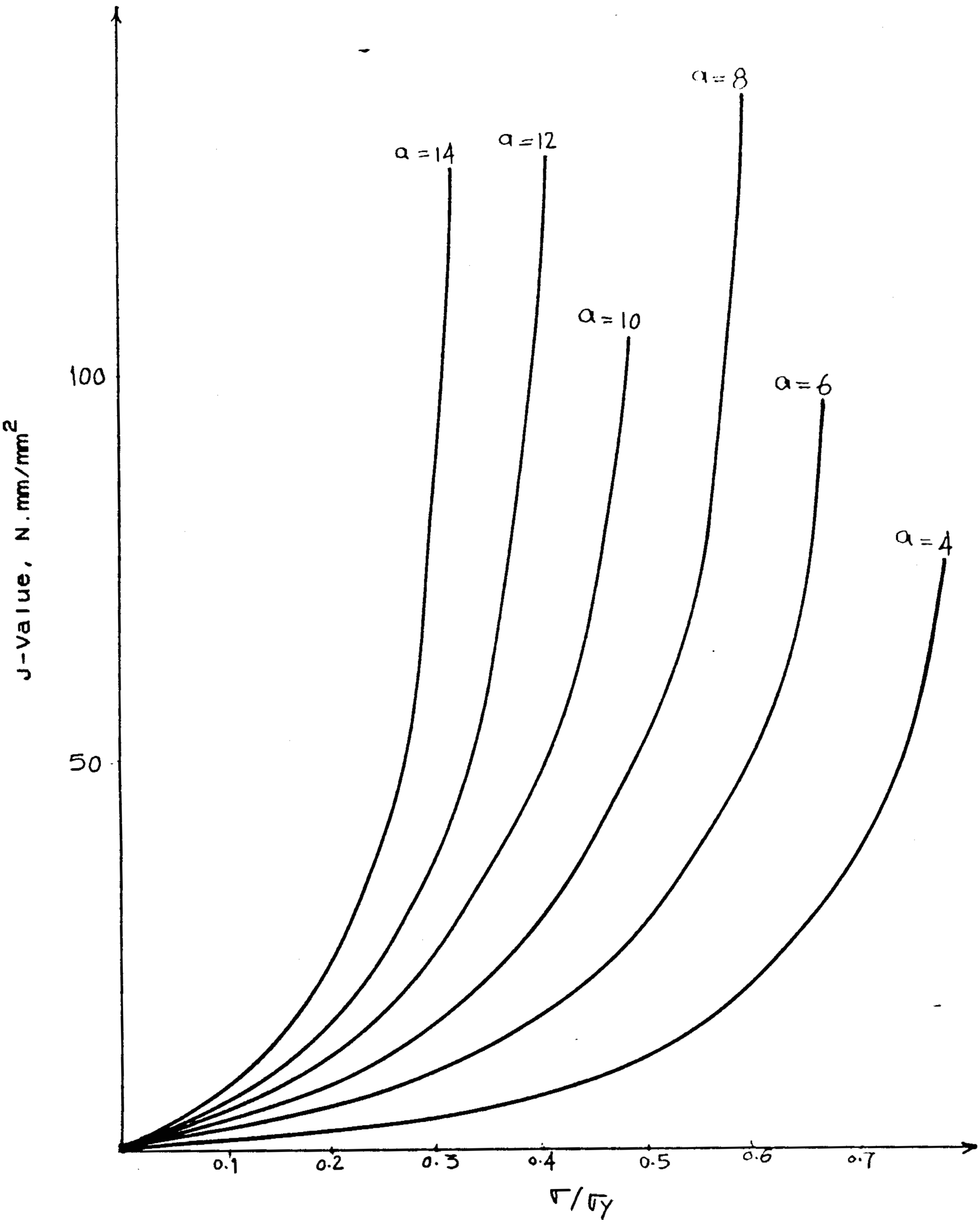


Figure 22. J-values for different crack lengths at various stress levels

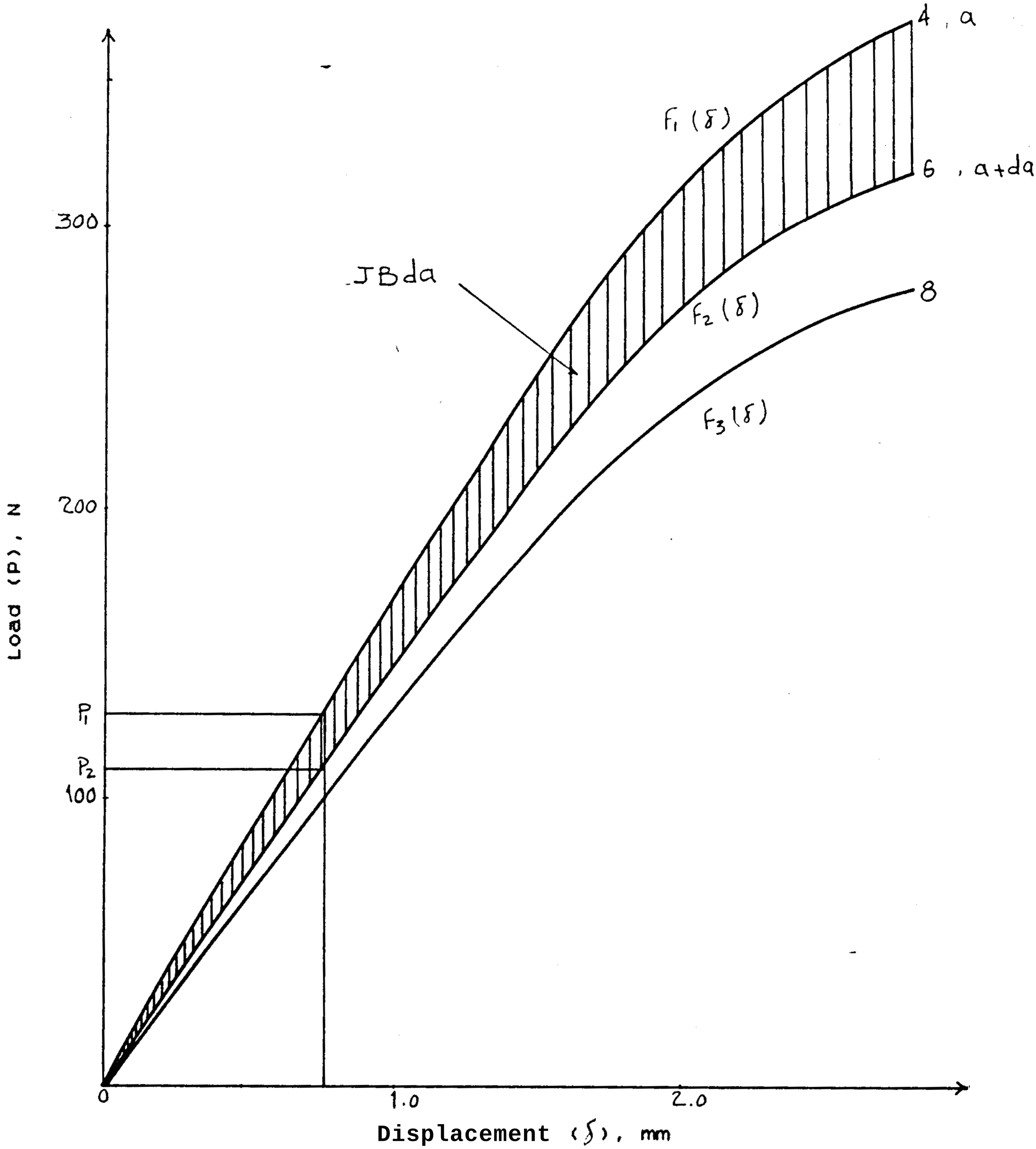


Figure 23. Load-displacement curves to determine J value from the load-displacement curve method

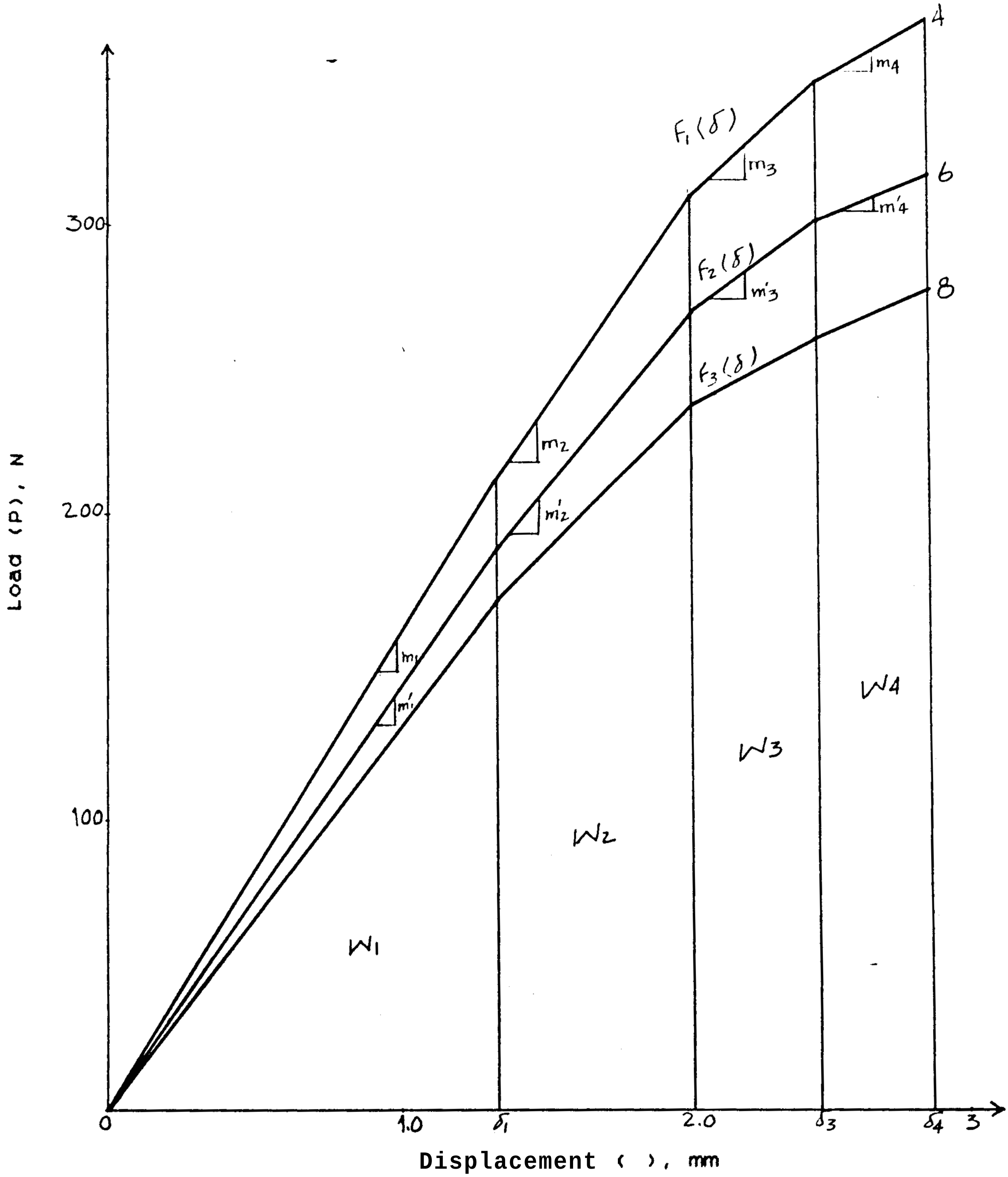


Figure 24. Load-displacement curves to determine J value from the generalized stiffness gradient method

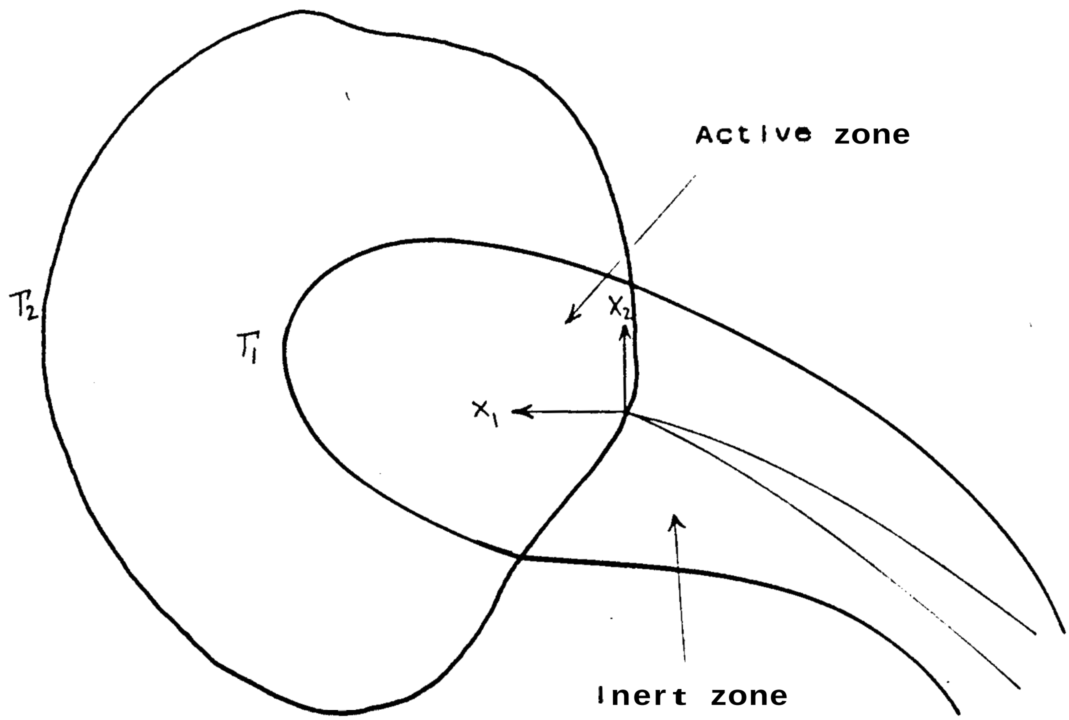


Figure 25. Active ana inert zone within a plate

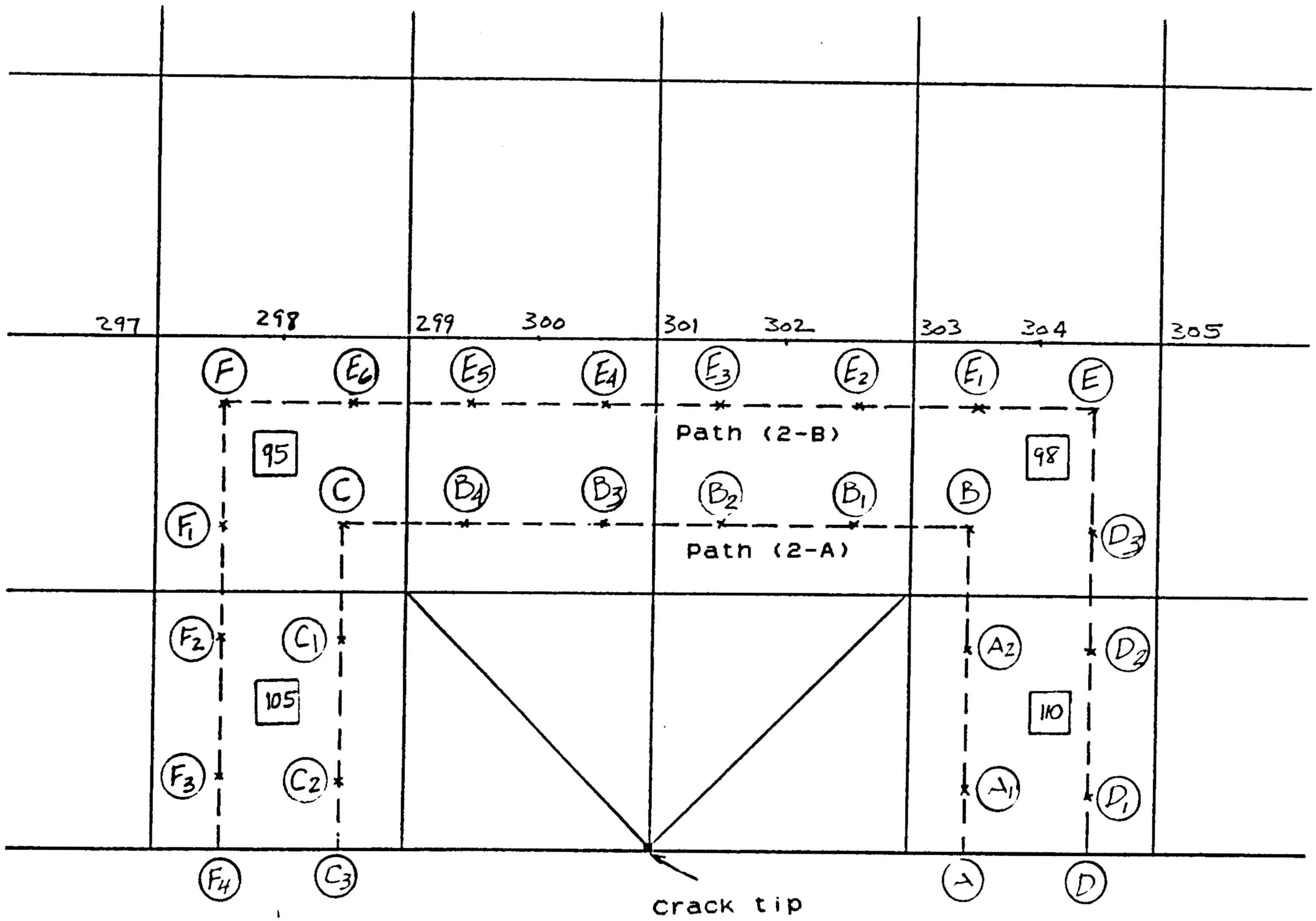


Figure 26. Selected path to determine J- and M-integrals

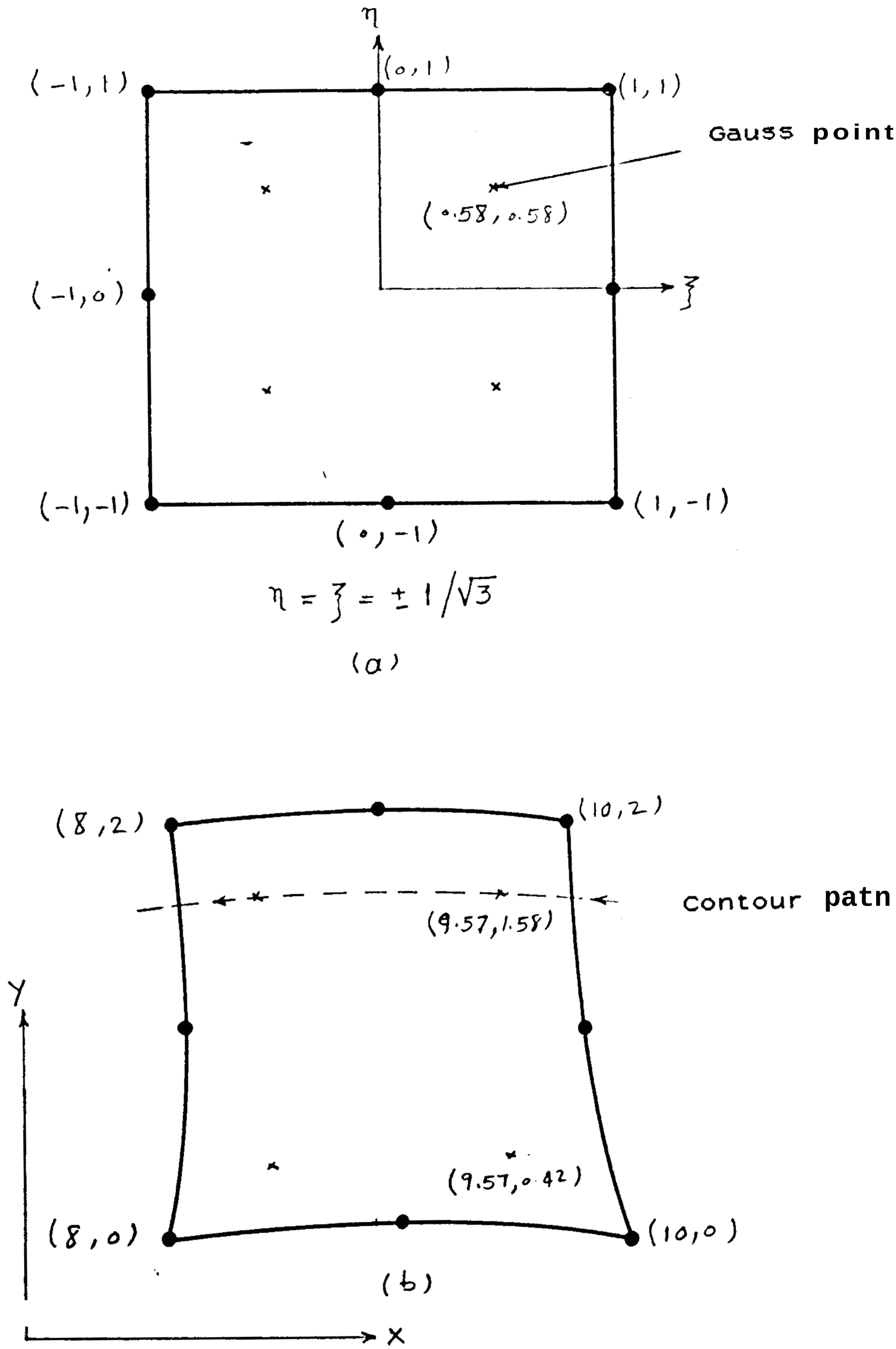


Figure 27. Location of the integration points in local (a) ana global (b) systems

$$u = a_0 + a_1 x + a_2 y + a_3 xy$$

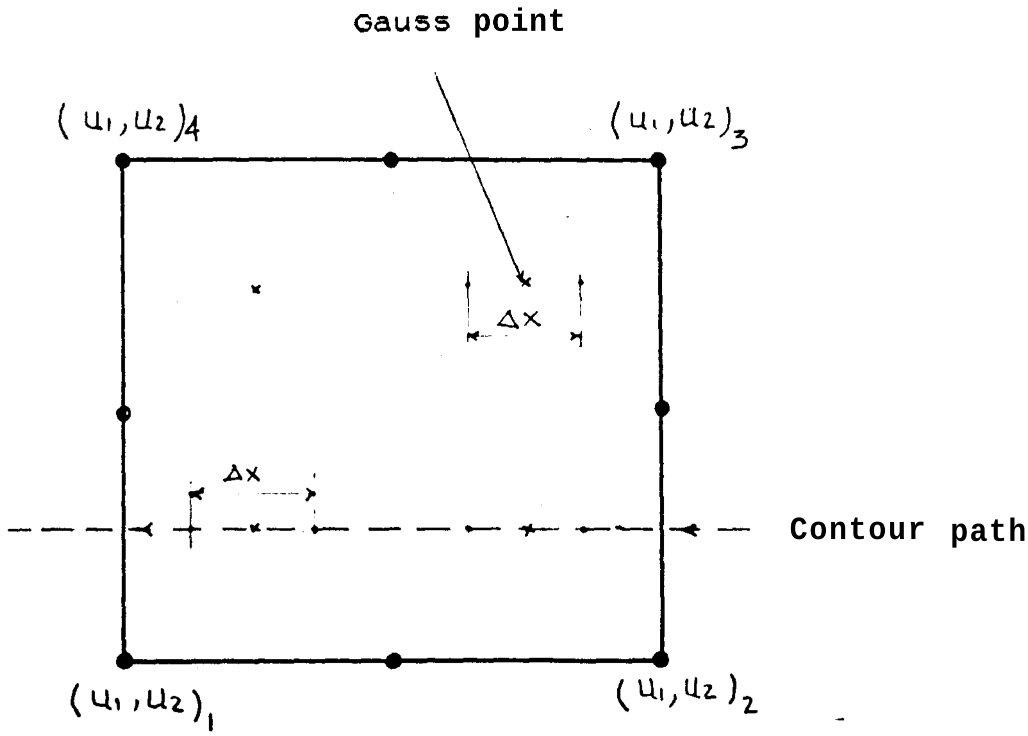


Figure 28. An element representation to determine the displacement within the element

Table 1. Comparison of tne plastic zone values from different meshes witn tneoretical value, a/w = 0.5, σ/σ_y=0.2

Theoretical mm	From FE analysis			
	For M1 mm	For M2 mm	For M3 mm	For M4 mm
1.918	2.9	2.6	1.8	2.45

Table 2. The average J-values obtained from FE grids M3 and M4 at different load levels, a/w=0.5

σ/σ_y	J-values for a/w = 0.5	
	M3 $N.mm/mm^2$	M4 $N.mm/mm^2$
0.01	0.195075D+00	0.212929D+00
0.04	0.312120D+01	0.345148D+01
0.07	0.955868D+01	0.106885D+02
0.10	0.195440D+02	0.220949D+02
0.13	0.364363D+02	0.430505D+02
0.17	0.623268D+02	0.740804D+02
0.20	0.101768D+03	0.127919D+03
0.21	0.122520D+03	0.159351D+03
0.23	0.148422D+03	0.201719D+03
0.24	0.181993D+03	0.268265D+03
0.25	0.227234D+03	-

Table 3. Comparison of the J-values obtained from FE analysis and theoretical value

J-values for a/w = 0.5, σ / σ_y = 0.01		
Theoretical	From FE analysis	
N.mm/mm^2	M3	M4
0.2197	0.1951	0.2129

Table 4. Elastic-plastic FE results for grid M4, a/w = 0.2

σ/σ_y	P, N	δ, mm	J, N.mm/mm^2	σ, N/mm^2
0.048	22.11	0.14	0.9940D-01	3.35
0.259	119.72	0.76	0.3023D-01	18.14
0.467	215.75	1.38	0.1080D-02	32.69
0.661	305.45	2.00	0.2717D-02	46.28
0.757	349.80	2.40	0.4774D-02	53.00
0.798	368.54	2.80	0.7567D-02	55.84

Table 5. Elastic-plastic FE results for grid M4, a/w = 0.3

σ/σ_y	P, N	δ, mm	J, N.mm/mm^2	σ, N/mm^2
0.045	20.79	0.14	0.1649D-00	3.15
0.241	111.47	0.76	0.5087D+01	16.89
0.430	198.73	1.38	0.1793D+02	30.11
0.587	271.06	2.00	0.4381D+02	41.07
0.656	302.87	2.40	0.6890D+02	45.89
0.686	316.87	2.80	0.9716D+02	48.01

Table 6. Elastic-plastic FE results for grid M4, a/w = 0.4

σ / σ_y	P, N	δ, mm	J, N.mm/mm^2	σ, N/mm^2
0.041	18.94	0.14	0.2344D+01	2.87
0.221	101.97	0.76	0.7035D+01	15.45
0.386	178.20	1.38	0.2451D+02	27.00
0.514	237.27	2.00	0.5522D+02	35.95
0.569	263.01	2.40	0.8093D+02	39.85
0.599	276.73	2.80	0.1089D+03	41.93
0.610	281.56	3.20	0.1371D+03	42.66

Table 7. Elastic-plastic FE results for grid M4, a/w = 0.5

σ/σ_y	P,N	δ,mm	J,N.mm/mm^2	σ,N/mm^2
0.027	12.24	0.14	0.2695D+00	1.86
0.187	86.20	0.76	0.8044D+01	13.06
0.322	148.76	1.38	0.2692D+02	22.54
0.418	193.02	2.00	0.5647D+02	29.25
0.463	213.79	2.40	0.7959D+02	32.40
0.496	228.91	2.80	0.1040D+03	34.68

Table 8. Elastic-plastic FE results for grid M4, a/w = 0.6

σ/σ_y	P, N	δ, mm	J, N.mm/mm^2	σ, N/mm^2
0.029	13.63	0.14	0.2833D+00	2.07
0.156	72.27	0.76	0.8326D+01	10.95
0.265	122.33	1.38	0.2715D+02	18.54
0.343	158.37	2.00	0.5479D+02	23.99
0.378	174.70	2.40	0.7600D+02	26.47
0.399	184.40	2.80	0.9897D+03	27.94
0.406	187.40	3.20	0.1221D+03	28.40

Table 9. Elastic-plastic FE results for grid M4, a/W = 0.7

σ / σ_y	P, N	δ, mm	J, N.mm/mm^2	σ, N/mm^2
0.024	10.86	0.14	0.2713D+00	1.65
0.130	60.06	0.76	0.7884D+01	9.10
0.210	97.02	1.38	0.2539D+02	14.70
0.272	125.73	2.00	0.5080D+02	19.05
0.297	137.09	2.40	0.7091D+02	20.77
0.306	141.50	2.80	0.9377D+03	21.44
0.309	142.96	3.20	0.1182D+03	21.66

Table 10. comparison between tne elastic-plastic FE analysis and the estimate tecnniques

Methods	Crack depth a, mm	Displacement δ, mm	Failure load P, N	J-value N.mm/mm	Error %
Method1	4	2.8	368.54	75.67	-
(2.21)	6	2.8	316.87	97.16	-
Method2	4	2.8	368.54	70.90	6
(4.3)	6	2.8	316.87	97.42	0.278
Metnods	4	2.8	368.54	94.00	24.40
(4.8)	6	2.8	316.87	102.39	5.38

Table 11. Comparison of the J-value between the elastic-plastic FE analysis and numerical calculation

FE anlysis	Numerical calculation					
	From path (2-A)			From patn (2-B)		
	J1	J2	M	J1	J2	M
0.220112	**0.223976**	0.035303	0.078828	0.243221	0.066592	0.07305

Table 12. comparison of M-values between the theoretical value and numerical calculation

Theoretical value (5.24)	Numerical calculation			
	α	M from patn (2-A)	M from patn (2-B)	Error %
0.0770372	0.35	0.078828	-	2.3
0.0790422	0.30	-	0.0730483	8.2

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APPENDIX A

Results for Calculation of J- and M-integrals for patns (2-A) and (2-B)

APPENDIX A

Stresses from FE analysis (Path 2- A), a/w = *8/20*, σ = 2.9

I.P	σ_{yy}	σ_{zz}	σ_{yz}	ϵ_{yy}	ϵ_{zz}	ϵ_{yz}
A	-0.3	0.0	-0.1	-0.160D-03	0.729D-04	-0.148D-03
A_1	1.0	0.6	0.9	0.398D-03	0.132D-04	0.126D-03
B	0.8	0.8	0.8	0.272D-03	0.251D-03	0.111D-02
B_1	1.2	2.7	2.4	0.145D-03	0.114D-03	0.314D-02
B_2	0.7	5.6	1.4	-0.551D-03	0.266D-02	0.192D-02
B_3	0.4	6.5	1.0	-0.880D-03	0.318D-02	0.138D-02
B_4	0.9	6.8	-0.3	-0.656D-03	0.323D-02	-0.405D-03
C	0.6	5.9	-0.7	-0.675D-03	0.286D-02	-0.872D-03
C_1	1.7	5.9	-1.3	-0.111D-03	0.269D-02	-0.170D-02
C_2	3.7	6.0	-0.5	0.830D-03	0.242D-02	-0.715D-03

stresses from-FE analysis (Path 2-81, a/w = 8/20, σ = 2.9

I.P	σ_{yy}	σ_{zz}	σ_{yz}	ϵ_{yy}	ϵ_{zz}	ϵ_{yz}
D	-0.5	-0.2	-0.1	-0.228D-03	-0.123D-04	-0.120D-03
D_1	0.5	0.1	0.2	0.248D-03	-0.579D-04	0.259D-03
D_2	0.5	1.5	0.5	0.158D-03	0.162D-03	0.669D-03
E	0.6	1.0	0.7	0.165D-03	0.373D-03	0.925D-03
E_1	0.8	3.7	1.3	0.100D-03	0.725D-03	0.178D-02
E_2	0.4	4.1	1.7	-0.294D-03	0.148D-02	0.227D-02
E_3	0.0	5.7	1.4	-0.770D-03	0.237D-02	0.182D-02
E_4	0.1	5.4	0.8	-0.955D-03	0.273D-02	0.101D-02
E_5	0.1	5.9	-0.1	-0.101D-02	0.296D-02	-0.962D-04
E_6	0.1	5.5	-0.5	-0.842D-03	0.272D-02	-0.717D-03
F	0.3	5.0	-0.8	-0.668D-03	0.244D-02	-0.110D-02
F_1	0.9	5.1	-1.0	-0.379D-03	0.240D-02	-0.131D-02
F_2	1.7	4.9	-1.0	0.453D-04	0.218D-02	-0.128D-02
F_3	2.5	4.7	-0.4	0.483D-03	0.193D-02	-0.477D-03

J1 calculation (path 2-A), a/W = 8/20, $\bar{\sigma}$ = 2.9

Path	F	$u_{2,1}$	$\sigma_{22} u_{2,1}$	$\sigma_{21} u_{2,1}$
$A-A_1$	0.039D-03	4.880D-03	0.000D-00	-0.490D-03
A_1-A_2	1.369D-03	4.740D-03	2.844D-03	4.270D-03
A_2-B	1.100D-03	4.607D-03	3.690D-03	3.690D-03
$B-B_1$	-	6.035D-03	1.630D-02	1.448D-02
B_1-B_2	-	6.034D-03	3.379D-02	8.450D-03
B_2-B_3	-	3.141D-03	2.042D-02	3.140D-03
B_3-B_4	-	3.141D-03	2.135D-02	-0.940D-03
B_4-C	-	0.993D-03	5.860D-03	-0.695D-03
$C-C_1$	1.005D-02	0.727D-03	4.290D-03	-0.950D-03
C_1-C_2	8.964D-03	0.360D-03	2.160D-03	-0.180D-03

J2 calculation (path 2-A), a/w = 8/20, $\bar{\gamma}$ = 2.9

Path	f	$u_{2,1}$	$\sqrt{\tau_{22}}\, u_{2,1}$	$u_{2,1}$
$A-A_1$	-	0.574D-03	-0.172D-03	0.5740-03
A_1-A2	-	0.540D-03	0.540D-03	0.540D-03
A_2-B	-	0.100D-03	0.080D-03	0.100D-03
$B-B_1$	9.167D-03	0.100D-03	0.120D-03	0.100D-03
B_1-B_2	9.942D-03	0.100D-03	0.070D-03	0.100D-03
B_2-B_3	1.154D-02	1.286D-03	0.514D-03	1.286D-03
B_3-B_4	1.081D-02	1.285D-03	1.157D-03	1.285D-03
B_4-C	8.843D-03	0.075D-03	0.045D-03	0.0750-03
$C-C_1$	-	0.184D-03	0.313D-03	0.184D-03
C_1-C_2	-	0.508D-03	1.880D-03	0.508D-03

J1 calculation (path 2-B), a/w = 8/20, ψ = 2.9

Path	f	$u_{2,1}$	$\sigma_{22} u_{2,1}$	$\sigma_{21} u_{2,1}$
D-D_1	0.082D-03	0.490D-02	-0.098D-02	-0.049D-02
D_1-D_2	0.109D-03	0.470D-02	0.047D-02	0.094D-02
D_2-E	0.160D-03	0.461D-02	0.230D-02	0.231D-02
E-E_1	0.360D-03	0.439D-02	0.439D-02	0.307D-02
$_1$-E_2	-	0.439D-02	0.746D-02	0.571D-02
E_2-E_3	-	0.483D-02	1.497D-02	0.821D-02
E_3-E_4	-	0.483D-02	2.270D-02	0.676D-02
E_4-E_5	-	0.312D-02	1.680D-02	0.250D-02
E_5-E_6	-	0.300D-02	1.770D-02	-0.030D-02
E_6-E_7	-	0.140D-02	0.770D-02	-0.070D-02
E_7-F	-	0.140D-02	0.700D-02	-0.112D-02
F-F	6.330D-03	0.100D-02	0.510D-02	-0.100D-02
F_1-F_2	5.300D-03	0.068D-02	0.330D-02	-0.068D-02
F_2-F_3	4.880D-03	0.019D-02	0.090D-02	-0.008D-02

J2 **calculation** (path 2-B), a/w = *8/20,* $\bar{\sigma}$ = 2.9

Path	f	$u_{2,1}$	$\sigma_{22}\, u_{1,1}$	$\sigma_{21}\, u_{2,1}$
$D-D_1$	-	0.573D-03	-0.287D-03	-0.057D-03
D_1-D_2	-	0.054D-03	0.027D-03	0.011D-03
D_2-D_3	-	0.104D-03	0.052D-03	0.052D-03
D_3-E	-	0.210D-03	0.126D-03	0.147D-03
$E-E_1$	2.970D-03	0.022D-03	0.018D-03	0.029D-03
E_1-E_2	6.090D-03	0.410D-03	1.162D-03	0.697D-03
E_2-E_3	8.120D-03	0.430D-03	0.000D-00	0.602D-03
E_3-E_4	8.230D-03	2.233D-03	-0.223D-03	1.790D-03
E_4-E_5	8.790D-03	3.132D-03	-0.313D-03	-0.313D-03
E_5-E_6	7.470D-03	1.479D-03	0.148D-03	-0.740D-03
E_6-F	6.880D-03	1.480D-03	0.444D-03	-1.180D-03
$F-F_1$	-	0.079D-03	0.071D-03	-0.079D-03
F_1-F_2	-	0.182D-03	0.310D-03	-0.183D-03
F_2-F_3	-	0.091D-03	0.230D-03	-0.036D-03

APPENDIX B

Input and output data for computer program (NFAP)

8.1 Sample input data for tensile specimen of constantly applied stress along tne upper and lower eages.

B.2 Sample output data for tensile specimen of constantly applied stress along tne upper and lower edges.

8.3 Sample input data for tensile specimen of constantly applied displacement along the upper and lower eages

INPUT CARD IMAGES

```
CARD
NO./COL. 1........10........20........30........40........50........60........70........80
   1      EDGE NOTCH SPECIMEN MESH #5
   2       383100111        1    1    1
   3                            1
   4     0.0       1.0       2.0
   5
   6         1         1                              0.0       40.0
   7         2                                        1.0       40.0
   8         3                                        2.0       40.0
   9         4                                        3.0       40.0
  10         5                                        4.0       40.0
  11         6                                        5.0       40.0
  12         7                                        6.0       40.0
  13         8                                        7.0       40.0
  14         9                                        8.0       40.0
  15        10                                        9.0       40.0
  16        11                                       10.0       40.0
  17        12                                       11.0       40.0
  18        13                                       12.0       40.0
  19        14                                       13.0       40.0
  20        15                                       14.0       40.0
  21        16                                       15.0       40.0
  22        17                                       16.0       40.0
  23        18                                       17.0       40.0
  24        19                                       18.0       40.0
  25        20                                       19.0       40.0
  26        21                                       20.0       37.0
  27        22                                       0.0        37.0
  28        23                                       2.0        37.0
  29        24                                       4.0        37.0
  30        25                                       6.0        37.0
  31        26                                       8.0        37.0
  32        27                                       10.0       37.0
  33        28                                       12.0       37.0
  34        29                                       14.0       37.0
  35        30                                       16.0       37.0
  36        31                                       18.0       37.0
  37        32                                       20.0       37.0
  38        33                                       0.0        34.0
  39        34                                       1.0        34.0
  40        35                                       2.0        34.0
  41        36                                       3.0        34.0
  42        37                                       4.0        34.0
  43        38                                       5.0        34.0
  44        39                                       6.0        34.0
  45        40                                       7.0        34.0
  46        41                                       8.0        34.0
  47        42                                       9.0        34.0
  48        43                                       10.0       34.0
  49        44                                       11.0       34.0
  50        45                                       12.0       34.0
```

CARD
NO./COL. 1........10........20........30........40........50........60........70........80

51	46	13.0	34.0
52	47	14.0	34.0
53	48	15.0	34.0
54	49	16.0	34.0
55	50	17.0	34.0
56	51	18.0	34.0
57	52	19.0	34.0
58	53	20.0	34.0
59	54	0.0	31.0
60	55	2.0	31.0
61	56	4.0	31.0
62	57	6.0	31.0
63	58	8.0	31.0
64	59	10.0	31.0
65	60	12.0	31.0
66	61	14.0	31.0
67	62	16.0	31.0
68	63	18.0	31.0
69	64	20.0	31.0
70	65	0.0	28.0
71	66	1.0	28.0
72	67	2.0	28.0
73	68	3.0	28.0
74	69	4.0	28.0
75	70	5.0	28.0
76	71	6.0	28.0
77	72	7.0	28.0
78	73	8.0	28.0
79	74	9.0	28.0
80	75	10.0	28.0
81	76	11.0	28.0
82	77	12.0	28.0
83	78	13.0	28.0
84	79	14.0	28.0
85	80	15.0	28.0
86	81	16.0	28.0
87	82	17.0	28.0
88	83	18.0	28.0
89	84	19.0	28.0
90	85	20.0	28.0
91	86	0.0	25.0
92	87	2.0	25.0
93	88	4.0	25.0
94	89	6.0	25.0
95	90	8.0	25.0
96	91	10.0	25.0
97	92	12.0	25.0
98	93	14.0	25.0
99	94	16.0	25.0
100	95	18.0	25.0

(B. 1)

CARD
NO./COL. 1........10........20........30........40........50........60........70........80

101	96	20.0	25.0
102	97	0.0	22.0
103	98	1.0	22.0
104	99	2.0	22.0
105	100	3.0	22.0
106	101	4.0	22.0
107	102	5.0	22.0
108	103	6.0	22.0
109	104	7.0	22.0
110	105	8.0	22.0
111	106	9.0	22.0
112	107	10.0	22.0
113	108	11.0	22.0
114	109	12.0	22.0
115	110	13.0	22.0
116	111	14.0	22.0
117	112	15.0	22.0
118	113	16.0	22.0
119	114	17.0	22.0
120	115	18.0	22.0
121	116	19.0	22.0
122	117	20.0	22.0
123	118	0.0	20.0
124	119	2.0	20.0
125	120	4.0	20.0
126	121	6.0	20.0
127	122	8.0	20.0
128	123	10.0	20.0
129	124	12.0	20.0
130	125	14.0	20.0
131	126	16.0	20.0
132	127	18.0	20.0
133	128	20.0	20.0
134	129	0.0	18.0
135	130	1.0	18.0
136	131	2.0	18.0
137	132	3.0	18.0
138	133	4.0	18.0
139	134	5.0	18.0
140	135	6.0	18.0
141	136	7.00	18.0
142	137	8.00	18.0
143	138	9.0	18.0
144	139	10.0	18.0
145	140	11.0	18.0
146	141	12.0	18.0
147	142	13.0	18.0
148	143	14.0	18.0
149	144	15.0	18.0
150	145	16.0	18.0

CARD
NO./COL. 1........10........20........30........40........50........60........70........80

151	146	17.0	18.0
152	147	18.0	18.0
153	148	19.0	18.0
154	149	20.0	18.0
155	150	0.0	16.5
156	151	2.0	16.5
157	152	4.0	16.5
158	153	6.0	16.5
159	154	8.0	16.5
160	155	10.0	16.5
161	156	12.0	16.5
162	157	14.0	16.5
163	158	16.0	16.5
164	159	18.0	16.5
165	160	20.0	16.5
165	161	0.0	15.0
167	162	1.0	15.0
168	163	2.0	15.0
169	164	3.0	15.0
170	165	4.0	15.0
171	166	5.0	15.0
172	167	6.0	15.0
173	168	7.0	15.0
174	169	8.0	15.0
175	170	9.0	15.0
176	171	10.0	15.0
177	172	11.0	15.0
178	173	12.0	15.0
179	174	13.0	15.0
180	175	14.0	15.0
181	176	15.0	15.0
182	177	16.0	15.0
183	178	17.0	15.0
184	179	18.0	15.0
185	180	19.0	15.0
186	181	20.0	15.0
187	182	0.0	13.5
188	183	2.0	13.5
189	184	4.0	13.5
190	185	6.0	13.5
191	186	8.0	13.5
192	187	10.0	13.5
193	188	12.0	13.5
194	189	14.0	13.5
195	190	16.0	13.5
196	191	18.0	13.5
197	192	20.0	13.5
198	193	0.0	12.0
199	194	1.0	12.0
200	195	2.0	12.0

CARD NO./COL.	1........10........20........30........40........	50...	....60........70........80
201	196		
202	197	3.0	12.0
203	198	4.0	12.0
204	199	5.0	12.0
205	200	6.0	12.0
206	231	7.0	12.0
207	202	6.0	12.0
208	203	9.0	12.0
209	LOU	10.0	12.0
210	205	11.0	12.0
211	206	12.0	12.0
212	207	13.0	12.0
213	208	14.0	12.0
214	209	15.0	12.0
215	210	16.0	12.0
216	211	17.0	12.0
217	212	18.0	12.0
218	213	19.0	12.0
219	214	20.0	12.0
220	215	0.0	10.5
221	216	2.0	10.5
222	217	4.0	10.5
223	218	6.0	10.5
224	219	8.0	10.5
225	220	10.0	10.5
226	221	12.0	10.5
227	222	14.0	10.5
228	223	16.0	10.5
229	224	18.0	10.5
230	225	20.0	10.5
231	226	0.0	9.0
232	227	1.0	9.0
233	228	2.0	9.0
234	229	3.0	9.0
235	230	4.0	9.0
236	231	5.0	9.0
237	232	6.0	9.0
238	233	7.0	9.0
239	234	8.0	9.0
240	235	9.0	9.0
241	236	10.0	9.0
242	237	11.0	9.0
243	238	12.0	9.0
244	239	13.0	9.0
245	240	14.0	9.0
246	241	15.0	9.0
247	242	16.0	9.0
248	243	17.0	9.0
249	244	18.0	9.0
250	245	19.0	9.0
		20.0	9.0

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CARD
NO./COL. 1........10........20........30........40........50........60........70........80

251	246	0.0	7.5
252	247	2.0	7.5
253	248	4.0	7.5
254	249	6.0	7.5
255	250	8.0	7.5
256	i51	10.0	7.5
257	25.2	12.0	7.5
258	253	14.0	7.5
259	254	16.0	7.5
260	255	18.0	7.5
261	256	20.0	7.5
262	257	0.0	6.0
263	258	1.0	6.0
264	259	2.0	6.0
265	260	3.0	6.0
266	261	4.0	6.0
267	262	5.0	6.0
268	263	6.0	6.0
269	264	7.0	6.0
270	205	8.0	6.0
271	266	9.0	6.0
272	267	10.0	6.0
273	268	11.0	6.0
274	269	12.0	6.0
275	270	13.0	6.0
276	271	14.0	6.0
277	272	15.0	6.0
278	273	16.0	6.0
279	27U	17.0	6.0
280	275	18.0	6.0
281	276	19.0	6.0
282	277	20.0	6.0
283	278	0.0	5.0
284	279	2.0	5.0
285	280	4.0	5.0
286	281	6.0	5.0
287	2a2	8.0	5.0
288	2d3	10.0	5.0
289	284	12.0	5.0
290	285	14.0	5.0
291	286	16.0	5.0
292	287	18.0	5.0
293	288	20.0	5.0
294	2d9	0.0	4.0
295	290	1.0	4.0
296	291	2.0	4.0
297	292	3.0	4.0
298	293	4.0	4.0
299	294	5.0	4.0
300	295	6.0	4.0

CARD
NO./COL. 1........10........20........30........40........50........60........70........80

301	296	7.0	4.0
302	297	8.0	4.0
303	298	9.0	4.0
304	299	10.0	4.0
305	300	11.0	4.0
306	301	12.0	4.0
J07	302	13.0	4.0
308	303	14.0	4.0
309	304	15.0	4.0
310	305	16.0	4.0
311	306	17.0	4.0
312	307	18.0	4.0
313	308	19.0	4.0
314	309	20.0	4.0
315	310	0.0	3.0
316	311	2.0	3.0
317	312	4.0	3.0
318	313	6.0	3.0
319	314	8.0	3.0
320	315	10.0	3.0
321	316	12.0	3.0
322	317	14.0	3.0
323	318	16.0	3.0
324	319	18.0	3.0
325	320	20.0	3.0
326	321	0.0	2.0
327	322	1.0	2.0
328	323	2.0	2.0
329	324	3.0	2.0
330	325	4.0	2.0
331	326	5.0	2.0
332	327	6.0	2.0
333	328	7.0	2.0
334	329	8.0	2.0
335	330	9.0	2.0
336	331	10.0	2.0
337	332	11.0	2.0
338	333	12.0	2.0
339	334	13.0	2.0
340	335	14.0	2.0
341	336	15.0	2.0
342	337	16.0	2.0
343	338	17.0	2.0
344	339	18.0	2.0
345	340	19.0	2.0
346	341	20.0	2.0
347	342	0.0	1.0
348	343	2.0	1.0
349	344	4.0	1.0
350	345	6.0	1.0

(B.1)

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CARD
NO./COL. 1........10........20........30........40........50........60........70........80
 351       346                                        8.0       1.0
 352       347                                        9.5       0.5
 353       348                                        10.0      0.5
 354       349                                        10.5      0.5
 355       350                                        12.0      1.0
 356       351                                        14.0      1.0
 357       352                                        16.0      1.0
 358       353                                        18.5      1.0
 359       354                                        20.0      1.3
 360       355              1                         0.0       0.0
 361       356              1                         1.0       0.0
 362       357              1                         2.0       0.0
 363       358              1                         3.0       0.0
 364       359              1                         4.0       0.0
 365       360              1                         5.0       0.0
 366       361              1                         6.0       0.0
 367       362              1                         7.0       0.0
 368       363              1                         8.0       0.0
 369       364              1                         9.5       0.0
 370       365              1                         10.0      0.0
 371       366              1                         10.0      0.0
 372       367              1                         10.0      0.0
 373       368              1                         10.0      0.0
 374       369              1                         10.0      0.0
 375       370              1                         10.0      0.0
 376       371              1                         10.0      0.0
 377       372              1                         10.0      0.0
 378       373              1                         10.0      0.0
 379       374                                        10.5      0.0
 380       375                                        12.0      0.0
 381       376                                        13.0      0.0
 382       377                                        14.0      0.0
 383       378                                        15.0      0.0
 384       379                                        16.0      0.0
 385       380                                        17.5      0.0
 386       381                                        19.0      0.0
 387       382                                        19.5      0.288
 388       383                                        20.0      0.577
 389        21    1   10         0    0    0
 390
 391        2 112   1       2       8           2               1   3   1
 392         1
 393     81357.    0.33      834.6216
 394         1    8    1    1                    1.3
 395        33   35    3    1   34   23    2   22
 396         2    8    1    1                    1.3
 397        35   37    5    3   36   24    4   23
 398         3    8    1    1                    1.3
 399        37   39    7    5   38   25    6   24
 400         4    8    1    1                    1.3
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(B.1)

CAED

NO./COL. 1........10........20........30........40........50........60........70........80

CAED NO./COL.									
401	39	41	9	7	40	26	8	25	
402	5	8	1	1					1.3
403	41	43	11	9	42	27	10	26	
404	6	8	1	1					1.3
405	43	45	13	11	44	28	12	27	
406	7	8	1	1					1.3
407	45	47	15	13	46	29	14	28	
408	8	8	1	1					1.3
409	47	49	17	15	48	30	16	29	
410	9	8	1	1					1.3
411	49	51	19	17	50	31	18	30	
412	10	8	1	1					1.3
413	51	53	21	19	52	32	20	31	
414	11	8	1	1					1.3
415	65	67	35	33	66	55	34	54	
416	12	8	1	1					1.3
417	67	69	37	35	68	56	36	55	
418	13	8	1	1					1.3
419	69	71	39	37	70	57	38	56	
420	14	8	1	1					1.3
421	71	73	41	39	72	58	40	57	
422	15	8	1	1					1.3
423	73	75	43	41	74	59	42	58	
424	16	8	1	1					1.3
425	75	77	45	43	76	60	44	59	
426	17	8	1	1					1.3
427	77	79	47	45	78	61	46	60	
428	18	8	1	1					1.3
429	79	81	49	47	80	62	48	61	
430	19	8	1	1					1.3
431	81	83	51	49	82	63	50	62	
432	20	8	1	1					1.3
433	83	85	53	51	84	64	52	63	
434	21	8	1	1					1.3
435	97	99	67	65	98	87	66	86	
436	22	8	1	1					1.3
437	99	101	69	67	100	88	68	87	
438	23	8	1	1					1.3
439	101	103	71	69	102	89	70	88	
440	24	8	1	1					1.3
441	103	105	73	71	104	90	72	89	
442	25	8	1	1					1.3
443	105	107	75	73	106	91	74	90	
444	26	8	1	1					1.3
445	107	109	77	75	108	92	76	91	
446	27	8	1	1					1.3
447	109	111	79	77	110	93	78	92	
448	28	8	1	1					1.3
449	111	113	81	79	112	94	80	93	
450	29	8	1	1					1.3

CARD NO./COL.	1.......10		20		30		40		........50........60........70........80
451	113	115	83	81	114	95	82	94	
452	30	8	1	1					1.3
453	115	117	85	83	116	90	84	95	
454	31	8	1	1					1.3
455	129	131	93	37	130	119	98	118	
456	32	8	1	1					1.3
457	131	133	101	99	132	120	100	119	
458	33	8	1	1					1.3
459	133	135	103	101	134	121	102	120	
460	34	8	1	1					1.3
461	135	137	105	103	136	122	104	121	
462	35	8	1	1					1.3
463	137	139	107	105	138	123	106	122	
464	36	8	1	1					1.3
465	139	141	109	107	140	124	108	123	
466	37	8	1	1					1.3
467	141	143	111	109	142	125	110	124	
468	38	8	1	1					1.3
469	143	145	113	111	144	126	112	125	
470	39	8	1	1					1.3
471	145	147	115	113	146	127	114	126	
472	40	8	1	1					1.3
473	147	149	117	115	148	128	116	127	
474	41	8	1	1					1.3
475	161	163	131	129	162	151	130	150	
476	42	8	1	1					1.3
477	163	165	133	131	164	152	132	151	
478	43	8	1	1					1.3
479	165	167	135	133	166	153	134	152	
480	44	8	1	1					1.3
481	167	169	137	135	168	154	136	153	
482	45	8	1	1					1.3
483	169	171	139	137	170	155	138	154	
484	46	8	1	1					1.3
485	171	173	141	139	172	156	140	155	
486	47	8	1	1					1.3
487	173	175	143	141	174	157	142	156	
488	48	8	1	1					1.3
489	175	177	145	143	176	158	144	157	
490	49	8	1	1					1.3
491	177	179	147	145	178	159	146	158	
492	50	8	1	1					1.3
493	179	181	149	147	180	160	148	159	
494	51	8	1	1					1.3
495	133	195	163	161	194	183	162	182	
496	52	a	1	1					1.3
497	195	197	165	163	196	tau	164	183	
498	53	8	1	1					1.3
499	197	199	167	165	198	185	166	184	
500	54	8	1	1					1.3

(B.1)

CARD
NO./COL. 1........10........20........30........40........50........60........70........80

CARD NO.									
501	199	201	163	167	200	186	168	185	
502	55	8	1	1					lo3
503	201	203	171	169	202	187	170	186	
SOU	56	8	1	1					1.3
505	203	205	173	171	204	189	172	187	
506	57	8	1	1					1.3
507	205	207	175	173	206	139	174	188	
508	58	8	1	1					1.3
509	207	209	177	175	209	190	176	193	
510	59	8	1	1					1.3
511	209	211	173	177	210	191	178	190	
512	60	8	1	1					1.3
513	211	213	181	173	212	192	180	191	
514	61	8	1	1					1.3
515	225	227	195	133	226	215	194	214	
516	62	8	1	1					1.3
517	227	229	197	135	228	216	196	215	
518	63	8	1	1					1.3
519	229	231	199	197	230	217	198	216	
520	64	8	1	1					1.3
521	231	233	201	199	232	218	200	217	
522	65	8	1	1					1.3
523	233	235	203	201	234	219	202	218	
524	66	8	1	1					1.3
525	235	237	205	203	236	220	204	219	
526	67	a	1	1					1.3
527	237	239	237	205	238	221	236	220	
528	68	8	1	1					1.3
529	239	241	209	207	240	222	208	221	
530	63	8	1	1					1.3
531	241	243	211	209	242	223	210	222	
532	70	8	1	1					1.3
533	243	245	213	211	2U4	224	212	223	
534	71	8	1	1					1.3
535	257	259	227	22s	258	247	226	246	
536	72	a	1	1					1.3
537	259	261	229	227	260	248	229	247	
538	73	8	1	1					1.3
539	261	263	231	229	262	249	230	249	
540	74	8	1	1					lo3
541	263	265	233	231	264	250	232	249	
542	75	8	1	1					1.3
543	265	207	235	233	266	251	234	250	
544	76	8	1	1					1.3
545	267	269	237	235	268	252	236	251	
546	77	8	1	1					1.3
5U7	269	271	239	237	270	253	238	252	
548	78	8	1	1					1.3
549	271	273	241	239	272	254	240	253	
550	79	8	1	1					1.3

CARD
NO./COL. 1........10........20........30........40........50........60........70........80

551	273	275	243	241	274	255	242	254	
552	60	8	1	1					1.3
553	275	277	245	243	276	256	244	255	
554	81	8	1	1					1.3
555	289	291	259	257	290	279	258	278	
556	82	8	1	1					1.3
557	291	293	261	259	292	280	260	279	
558	83	8	1	1					1.3
559	293	295	263	261	294	281	262	280	
560	84	8	1	1					1.3
561	295	297	265	263	296	282	264	281	
562	85	8	1	1					1.3
563	297	299	267	265	298	283	266	282	
564	86	8	1	1					1.3
565	299	301	269	267	300	284	268	283	
566	87	8	1	1					1.3
567	301	303	271	269	302	285	270	284	
568	88	8	1	1					1.3
569	303	305	273	271	304	286	272	285	
570	89	8	1	1					1.3
571	305	307	275	273	306	287	274	286	
572	90	8	1	1					1.3
573	307	309	277	275	308	288	276	287	
574	91	8	1	1					1.3
575	321	323	291	289	322	311	290	310	
576	92	8	1	1					1.3
577	323	325	293	291	324	312	292	311	
578	93	8	1	1					1.3
579	325	327	295	293	326	313	294	312	
580	94	8	1	1					1.3
581	327	329	297	295	328	314	296	313	
582	95	8	1	1					1.3
583	329	331	299	297	330	315	298	314	
584	96	8	1	1					1.3
585	331	333	301	299	332	316	300	315	
586	97	8	1	1					1.3
587	333	335	303	301	334	317	302	316	
588	98	8	1	1					1.3
589	335	337	305	303	336	318	304	317	
590	99	8	1	1					1.3
591	337	339	307	305	338	319	306	318	
592	100	8	1	1					1.3
593	339	341	309	307	340	320	308	319	
594	101	8	1	1					1.3
595	355	357	323	321	356	343	322	342	
596	102	8	1	1					1.3
597	357	359	325	323	358	344	324	343	
598	103	8	1	1					1.3
599	359	361	327	325	360	345	326	344	
600	104	8	1	1					1.3

```
CARD
NO./COL. 1........10........20........30........40........50........60........70........80
 601       361   363   329   327   362   346   328   345
 602       105     8     1     1                         1.3
 603       363   365   367   329   364   366   347   346
 604       106     8     1     1                         1.3
 605       367   369   331   329   368   348   330   347
 606       107     8     1     1                         1.3
 607       369   371   333   331   370   349   332   348
 608       108     8     1     1                         1.3
 609       373   375   333   371   374   350   349   372
 610       109     8     1     1                         1.3
 611       375   377   335   333   376   351   334   350
 612       110     8     1     1                         1.3
 613       377   379   337   335   378   352   336   351
 614       111     8     1     1                         1.3
 615       379   381   339   337   380   353   338   352
 616       112     8     1     1                         1.3
 617       361   383   341   339   382   354   340   353
 618
 619         8
 620       365   366   367   368   369   370   371   372   373
 621         1     5
 622     0.0        0.0        1.0        0.035      4.0        0.5        7.0        0.8
 623     10.0       0.9
 624         1     3     1      361.513
 625         2     3     1      1446.051
 626         3     3     1      723.026
 627         4     3     1      1446.051
 628         5     3     1      723.026
 629         6     3     1      1446.051
 630         7     3     1      723.026
 631         8     3     1      1446.051
 632         9     3     1      723.026
 633        10     3     1      1446.051
 634        11     3     1      723.026
 635        12     3     1      1446.051
 636        13     3     1      723.026
 637        14     3     1      1446.051
 638        15     3     1      723.026
 639        16     3     1      1446.051
 640        17     3     1      723.026
 641        18     3     1      1446.051
 642        19     3     1      723.026
 643        20     3     1      1446.051
 644        21     3     1      361.513
```

EDGE NOTCH SPECIMEN MESH #5

C O N T R O L   I N F O R M A T I O N

```
NUMBER OF NODAL POINTS . . . . . . . . . . . (NUMNP)    =  383
MASTER X-TRANSLATION CODE . . . . . . . . . . (IDOF(1)) =    1
MASTER Y-TRANSLATION CODE . . . . . . . . . . (IDOF(2)) =    0
MASTER Z-TRANSLATION CODE . . . . . . . . . . (IDOF(3)) =    0
MASTER X-ROTATION    CODE . . . . . . . . . . (IDOF(4)) =    1
MASTER Y-ROTATION    CODE . . . . . . . . . . (IDOF(5)) =    1
MASTER Z-ROTATION    CODE . . . . . . . . . . (IDOF(6)) =    1
NUMBER OF LINEAR ELEMENT GROUPS . . . . . . . (NEGL)    =    0
NUMBER OF NONLINEAR ELEMENT GROUPS . . . . . (NEGNL)   =    1
SOLUTION MODE . . . . . . . . . . . . . . . . (MODEX)   =    1
   EQ.0, DATA CHECK
   EQ.1, EXECUTION
   EQ.2, RESTART
TOTAL TIME STEP INCREMENT . . . . . . . . . (NSTE)     =    2
PRINTING INTERVAL . . . . . . . . . . . . . . (IPRI)    -    1
RESTART SAVE INTERVAL . . . . . . . . . . . . (IRINT)   = 9999
SPECIFIED BLOCK LENGTH . . . . . . . . . . . .(ISTOTE)  =    0

TEMPERATURE READING INDICATOR . . . . . . . (ITTAPE)   =    0
   EQ.0, NO TEMPERATURE READING IS REQUIRED
   EQ.1, READ NODAL TEMPERATURES FROM TAPE
   EQ.2, READ NODAL TEMPERATURES FROM CARDS

TEMPERATURE HISTORY INDICATOR . . . . . . . (NTEMP)    =    0
   EQ.0, UNIFORM TEMPERATURE
   EQ.1, STEADY STATE TEMPERATURE
   EQ.K, TEMPERATURE BECOMES STEADY STATE AFTER STEP K
```

```
  NUMBER OF TIME STEPS BETWEEN REFORMING
   EFFECTIVZ STIFFNESS MATRIX . . . . . . . . (ISEF)    =     1

 NUMBER OF ALLOWABLE STIFFNESS REFORMATIONS
   IN EACH TIME STEP . . . . . . . . . . . . (NUMREF)   =     0

 NUMBER OF TIME STEPS BETWEEN
   EQUILIBRIUM ITERATIONS . . . . . . . . . . (IEQUIT)  =     1

 MAXIMUM NUMBER OF EQUILIBRIUM
   ITERATIONS PERMITTED . . . . . . . . . . . (ITEMAX)  =    15

 ACCELERATION CODE . . . . . . . . . . . . . (IACC)     =     1
    EQ.0, NO ACCELERATION PERFORMED
    EQ.1, SECANT ACCELERATION

 CONVERGENCE TOLERANCE . . . . . . . . . . . (RTOL)= 0.10D-02


A H A L Y S I S   T Y P E

 TIME DEPENDENCY CODE . . . . . . . . . . . (ISTAT)    =     0
    EQ.0, STATIC ANALYSIS
    EQ.1, DYNAMIC ANALYSIS

 NONLINEARITY CODE . . . . . . . . . . . . . (KLIN)     =     1
    EQ.0, LINEAR ANALYSIS
    EQ.1, NONLINEAR ANALYSIS


D I S P / V E L / A C C   P R I N T O U T   C O D E

 NUMBER OF BLOCKS OF NODAL PRINTOUT . . . . . . (NPB)   =     1

 DISPLACEMENT PRINTOUT CODE . . . . . . . . . . (IDC)   =     1
    EQ.0, NO PRIHTIHG OF DISPLACEMENTS
    EQ.1, PRINT DISPLACEMENTS

 VELOCITY PRINTOUT CODE . . . . . . . . . . . . (IVC)   =     1
    EQ.0, NO PRINTING OF VELOCITIES
    EQ.1, PRINT VELOCITIES

 ACCELERATION PRINTOUT CODE . . . . . . . . . . (IAC)   =     1
    EQ.0, NO PRINTING OF ACCELERATIONS
    EQ.1, PRINT ACCELERATIONS

 BLOCK  1

    FIRST NODE OF THIS BLOCK  . . . . .(IPNODE(1,1) =     1

    LAST NGDE OF THIS BLOCK . . . . . .(IPNODE(2,1) =   383
```

```
T I M E   S T E P   I N F O R M A T I O N
STARTING TIME     TIME STEP INCREMENT     NUMBER OF TIME STEP
  0.0                  0.1000D+01                  2
```

N O D A L   P O I N T   D A T A

INPUT NODAL DATA

NODE	BOUNDARY CONDITION CODES X	Y	Z	XX	YY	ZZ	NODAL POINT COORDINATES X	Y	Z	MESH GENERATION CODES KN	IT
1	0	1	0	0	0	0	0.0	0.0	40.000	0	
2	0	0	0	0	0	0	0.0	1.000	40.000	0	
3	0	0	0	0	0	0	0.0	2.000	40.000	0	
4	0	0	0	0	0	0	0.0	3.000	40.000	0	
5	0	0	0	0	0	0	0.0	4.000	40.000	0	
6	0	0	0	0	0	0	0.0	5.000	40.000	0	
7	0	0	0	0	0	0	0.0	6.000	40.000	0	
8	0	0	0	0	0	0	0.0	7.000	40.000	0	
9	0	0	0	0	0	0	0.0	8.000	40.000	0	
10	0	0	0	0	0	0	0.0	9.000	40.000	0	
11	0	0	0	0	0	0	0.0	10.000	40.000	0	
12	0	0	0	0	0	0	0.0	11.000	40.000	0	
13	0	0	0	0	0	0	0.0	12.000	40.000	0	
14	0	0	0	0	0	0	0.0	13.000	40.000	0	
15	0	0	0	0	0	0	0.0	14.000	40.000	0	
16	0	0	0	0	0	0	0.0	15.000	40.000	0	
17	0	0	0	0	0	0	0.0	16.000	40.000	0	
18	0	0	0	0	0	0	0.0	17.000	40.000	0	
19	0	0	0	0	0	0	0.0	18.000	40.000	0	
20	0	0	0	0	0	0	0.0	19.000	40.000	0	
21	0	0	0	0	0	0	0.0	20.000	37.000	0	
22	0	0	0	0	0	0	0.0	0.0	37.000	0	
23	0	0	0	0	0	0	0.0	2.000	37.000	0	
24	0	0	0	0	0	0	0.0	4.000	37.000	0	
25	0	0	0	0	0	0	0.0	6.000	37.000	0	
26	0	0	0	0	0	0	0.0	8.000	37.000	0	
27	0	0	0	0	0	0	0.0	10.000	37.000	0	
28	0	0	0	0	0	0	0.0	12.000	37.000	0	
29	0	0	0	0	0	0	0.0	14.000	37.000	0	
30	0	0	0	0	0	0	0.0	16.000	37.000	0	
31	0	0	0	0	0	0	0.0	18.000	37.000	0	
32	0	0	0	0	0	0	0.0	20.000	37.000	0	
33	0	0	0	0	0	0	0.0	0.0	34.000	0	
34	0	0	0	0	0	0	0.0	1.000	34.000	0	
35	0	0	0	0	0	0	0.0	2.000	34.000	0	
36	0	0	0	0	0	0	0.0	3.000	34.000	0	
37	0	0	0	0	0	0	0.0	4.000	34.000	0	
38	0	0	0	0	0	0	0.0	5.000	34.000	0	
39	0	0	0	0	0	0	0.0	6.000	34.000	0	
40	0	0	0	0	0	0	0.0	7.000	34.000	0	
41	0	0	0	0	0	0	0.0	8.000	34.000	0	
42	0	0	0	0	0	0	0.0	9.000	34.000	0	
43	0	0	0	0	0	0	0.0	10.000	34.000	0	
44	0	0	0	0	0	0	0.0	11.000	34.000	0	
45	0	0	0	0	0	0	0.0	12.000	34.000	0	
46	0	0	0	0	0	0	0.0	13.000	34.000	0	
47	0	0	0	0	0	0	0.0	14.000	34.000	0	
48	0	0	0	0	0	0	0.0	15.000	34.000	0	
49	0	0	0	0	0	0	0.0	16.000	34.000	0	
50	0	0	0	0	0	0	0.0	17.000	34.000	0	
51	0	0	0	0	0	0	0.0	18.000	34.000	0	
52	0	0	0	0	0	0	0.0	19.000	34.000	0	
53	0	0	0	0	0	0	0.0	20.000	34.000	0	
54	0	0	0	0	0	0	0.0	0.0	31.000	0	
55	0	0	0	0	0	0	0.0	2.000	31.000	0	
56	0	0	0	0	0	0	0.0	4.000	31.000	0	
57	0	0	0	0	0	0	0.0	6.000	31.000	0	
58	0	0	0	0	0	0	0.0	8.000	31.000	0	

59	0	0	0	0	0	0	0.0	10,000	31.000	0
60	0	0	0	0	0	0	0.0	12.000	31.000	0
61	0	0	0	0	0	0	0.0	lU.030	31.000	0
62	0	0	0	0	0	0	0.0	lo. 000	31.000	0
63	0	0	0	0	0	0	0.0	ld.000	31.000	0
64	0	0	0	0	0	0	0.0	20.000	31.000	0
65	0	0	0	0	0	0	0.0	0.0	28.000	0
66	0	0	0	0	0	0	0.0	1.000	28.000	0
67	0	0	0	0	0	0	0.0	2.000	28.000	0
68	0	0	0	0	0	0	0.0	3. OGO	28.000	0
69	0	0	0	0	0	0	0.0	4.000	28.000	0
70	0	0	0	0	0	0	0.0	5.000	28.000	0
71	0	0	0	0	0	0	0.0	6.000	28.000	0
72	0	0	0	0	0	0	0.0	7.000	28.000	0
73	0	0	0	0	0	0	0.0	8.000	28.000	0
74	0	0	0	0	0	0	0.0	9.000	28.000	0
75	0	0	0	0	0	0	0.0	10.000	28.000	0
76	0	0	0	0	0	0	0.0	11.000	28.000	0
77	0	0	0	0	0	0	0.0	12.000	28.000	0
78	0	0	0	0	0	0	0.0	13.000	28.000	0
79	0	0	0	0	0	0	0.0	14.000	28.000	0
80	0	0	0	0	0	0	0.0	15.000	26.000	0
81	0	0	0	0	0	0	0.0	16.000	28.000	0
82	0	0	0	0	0	0	0.0	17.000	28.000	0
83	0	0	0	0	0	0	0.0	18.000	28.000	0
84	0	0	0	0	0	0	0.0	19.000	28.000	0
85	0	0	0	0	0	0	0.0	20.000	28.000	0
86	0	0	0	0	0	0	0.0	0.0	25.000	0
87	0	0	0	0	0	0	0.0	2.000	25.000	0
88	0	0	0	0	0	0	0.0	4.000	25.000	0
89	0	0	0	0	0	0	0.0	6.000	25.000	0
90	0	0	0	0	0	0	0.0	8.000	25.000	0
91	0	0	0	0	0	0	0.0	10.000	25.000	0
92	0	0	0	0	0	0	0.0	12.000	25.000	0
93	0	0	0	0	0	0	0.0	14.000	25.000	0
94	0	0	0	0	0	0	0.0	16.000	25.000	0
95	0	0	0	0	0	0	0.0	18.000	25.000	0
96	0	0	0	0	0	0	0.0	20.000	25.000	0
97	0	0	0	0	0	0	0.0	0.0	22.000	0
98	0	0	0	0	0	0	0.0	1.000	22.000	0
99	0	0	0	0	0	0	0.0	2.000	22.000	0
100	0	0	0	0	0	0	0.0	3.000	22.000	0
101	0	0	0	0	0	0	0.0	4.000	22.000	0
102	0	0	0	0	0	0	0.0	5.000	22.000	0
103	0	0	0	0	0	0	0.0	6.000	22.000	0
104	0	0	0	0	0	0	0.0	7.000	22.000	0
105	0	0	0	0	0	0	0.0	8.000	22.000	0
106	0	0	0	0	0	0	0.0	9.000	22.000	0
107	0	0	0	0	0	0	0.0	10.000	22.000	0
108	0	0	0	0	0	0	0.0	11.000	22.000	0
109	0	0	0	0	0	0	0.0	12.000	22.000	0
110	0	0	0	0	0	0	0.0	13.000	22.000	0
111	0	0	0	0	0	0	0.0	14.000	22.000	0
112	0	0	0	0	0	0	0.0	15.000	22.000	0
113	0	0	0	0	0	0	0.0	16.000	22.000	0
114	0	0	0	0	0	0	0.0	17.000	22.000	0
115	0	0	0	0	0	0	0.0	18.000	22.000	0
116	0	0	0	0	0	0	0.0	19.000	22.000	0
117	0	0	0	0	0	0	0.0	20.000	22.000	0
118	0	0	0	0	0	0	0.0	0.0	20.000	0
119	0	0	0	0	0	0	0.0	2.000	20.000	0
120	0	0	0	0	0	0	0.0	4.000	20.000	0
121	0	0	0	0	0	0	0.0	6.000	20.000	0
122	0	0	0	0	0	0	0.0	8.000	20.000	0
123	0	0	0	0	0	0	0.0	10.000	20.000	0
124	0	0	0	0	0	0	0.0	12.000	20.000	0
125	0	0	0	0	0	0	0.0	14.000	20.000	0
126	0	0	0	0	0	0	0.0	16.000	20.000	0

(B-2)

127	0	0	0	0	0	0	0.0	18.000	20.000	0
128	0	0	0	0	0	0	0.0	20.000	20.000	0
129	0	0	0	0	0	0	0.0	0.0	18.000	0
130	0	0	0	0	0	0	0.0	1.000	18.000	0
131	0	0	0	0	0	0	0.0	2.000	18.000	0
132	0	0	0	0	0	0	0.0	3.000	18.000	0
133	0	0	0	0	0	0	0.0	4.000	18.000	0
134	0	0	0	0	0	0	0.0	5.000	18.000	0
135	0	0	0	0	0	0	0.0	6.000	18.000	0
136	0	0	0	0	0	0	0.0	7.000	18.000	0
137	0	0	0	0	0	0	0.0	8.000	18.000	0
138	0	0	0	0	0	0	0.0	9.000	18.000	0
139	0	0	0	0	0	0	0.0	10.000	18.000	0
140	0	0	0	0	0	0	0.0	11.000	18.000	0
141	0	0	0	0	0	0	0.0	12.000	18.000	0
142	0	0	0	0	0	0	0.0	13.000	18.000	0
143	0	0	0	0	0	0	0.0	14.000	18.000	0
144	0	0	0	0	0	0	0.0	15.000	18.000	0
145	0	0	0	0	0	0	0.0	16.000	18.000	0
146	0	0	0	0	0	0	0.0	17.000	18.000	0
147	0	0	0	0	0	0	0.0	18.000	18.000	0
148	0	0	0	0	0	0	0.0	19.000	18.000	0
149	0	0	0	0	0	0	0.0	20.000	18.000	0
150	0	0	0	0	0	0	0.0	0.0	16.500	0
151	0	0	0	0	0	0	0.0	2.000	16.500	0
152	0	0	0	0	0	0	0.0	4.000	16.500	0
153	0	0	0	0	0	0	0.0	6.000	16.500	0
154	0	0	0	0	0	0	0.0	8.000	16.500	0
155	0	0	0	0	0	0	0.0	10.000	16.500	0
156	0	0	0	0	0	0	0.0	12.000	16.500	0
157	0	0	0	0	0	0	0.0	14.000	16.500	0
158	0	0	0	0	0	0	0.0	16.000	16.500	0
159	0	0	0	0	0	0	0.0	18.000	16.500	0
160	0	0	0	0	0	0	0.0	20.000	16.500	0
161	0	0	0	0	0	0	0.0	0.0	15.000	0
162	0	0	0	0	0	0	0.0	1.000	15.000	0
163	0	0	0	0	0	0	0.0	2.000	15.000	0
164	0	0	0	0	0	0	0.0	3.000	15.000	0
165	0	0	0	0	0	0	0.0	4.000	15.000	0
166	0	0	0	0	0	0	0.0	5.000	15.000	0
167	0	0	0	0	0	0	0.0	6.000	15.000	0
168	0	0	0	0	0	0	0.0	7.000	15.000	0
169	0	0	0	0	0	0	0.0	8.000	15.000	0
170	0	0	0	0	0	0	0.0	9.000	15.000	0
171	0	0	0	0	0	0	0.0	10.000	15.000	0
172	0	0	0	0	0	0	0.0	11.000	15.000	0
173	0	0	0	0	0	0	0.0	12.000	15.000	0
174	0	0	0	0	0	0	0.0	13.000	15.000	0
175	0	0	0	0	0	0	0.0	14.000	15.000	0
176	0	0	0	0	0	0	0.0	15.000	15.000	0
177	0	0	0	0	0	0	0.0	16.000	15.000	0
178	0	0	0	0	0	0	0.0	17.000	15.000	0
179	0	0	0	0	0	0	0.0	18.000	15.000	0
180	0	0	0	0	0	0	0.0	19.000	15.000	0
181	0	0	0	0	0	0	0.0	20.000	15.000	0
182	0	0	0	0	0	0	0.0	0.0	13.500	0
183	0	0	0	0	0	0	0.0	2.000	13.500	0
184	0	0	0	0	0	0	0.0	4.000	13.500	0
185	0	0	0	0	0	0	0.0	6.000	13.500	0
186	0	0	0	0	0	0	0.0	8.000	13.500	0
187	0	0	0	0	0	0	0.0	10.000	13.500	0
188	0	0	0	0	0	0	0.0	12.000	13.500	0
189	0	0	0	0	0	0	0.0	14.000	13.500	0
190	0	0	0	0	0	0	0.0	16.000	13.500	0
191	0	0	0	0	0	0	0.0	18.000	13.500	0
192	0	0	0	0	0	0	0.0	20.000	13.500	0
193	0	0	0	0	0	0	0.0	0.0	12.000	0
194	0	0	0	0	0	0	0.0	1.000	12.000	0

(B.2)

195	0	0	0	0	0	0	0.0	2.000	12.000	0
196	0	0	0	0	0	0	0.0	3.000	12.000	0
197	0	0	0	0	0	0	0.0	4.000	12.000	0
198	0	0	0	0	0	0	0.0	5.000	12.000	0
199	0	0	0	0	0	0	0.0	6.000	12.000	0
200	0	0	0	0	0	0	0.0	7.000	12.000	0
201	0	0	0	0	0	0	0.0	8.000	12.000	0
202	0	0	0	0	0	0	0.0	9.000	12.000	0
203	0	0	0	0	0	0	0.0	10.000	12.000	0
204	0	0	0	0	0	0	0.0	11.000	12.000	0
205	0	0	0	0	0	0	0.0	12.000	12.000	0
206	0	0	0	0	0	0	0.0	13.000	12.000	0
207	0	0	0	0	0	0	0.0	14.000	12.000	0
208	0	0	0	0	0	0	0.0	15.000	12.000	0
209	0	0	0	0	0	0	0.0	16.000	12.000	0
210	0	0	0	0	0	0	0.0	17.000	12.000	0
211	0	0	0	0	0	0	0.0	18.000	12.000	0
212	0	0	0	0	0	0	0.0	19.000	12.000	0
213	0	0	0	0	0	0	0.0	20.000	12.000	0
214	0	0	0	0	0	0	0.0	0.0	10.500	0
215	0	0	0	0	0	0	0.0	2.000	10.500	0
216	0	0	0	0	0	0	0.0	4.000	10.500	0
217	0	0	0	0	0	0	0.0	6.000	10.500	0
218	0	0	0	0	0	0	0.0	8.000	10.500	0
219	0	0	0	0	0	0	0.0	10.000	10.500	0
220	0	0	0	0	0	0	0.0	12.000	10.500	0
221	0	0	0	0	0	0	0.0	14.000	10.500	0
222	0	0	0	0	0	0	0.0	16.000	10.500	0
223	0	0	0	0	0	0	0.0	18.000	10.500	0
224	0	0	0	0	0	0	0.0	20.000	10.500	0
225	0	0	0	0	0	0	0.0	0.0	9.000	0
226	0	0	0	0	0	0	0.0	1.000	9.000	0
227	0	0	0	0	0	0	0.0	2.000	9.000	0
228	0	0	0	0	0	0	0.0	3.000	9.000	0
229	0	0	0	0	0	0	0.0	4.000	9.000	0
230	0	0	0	0	0	0	0.0	5.000	9.000	0
231	0	0	0	0	0	0	0.0	6.000	9.000	0
232	0	0	0	0	0	0	0.0	7.000	9.000	0
233	0	0	0	0	0	0	0.0	8.000	9.000	0
234	0	0	0	0	0	0	0.0	9.000	9.000	0
235	0	0	0	0	0	0	0.0	10.000	9.000	0
236	0	0	0	0	0	0	0.0	11.000	9.000	0
237	0	0	0	0	0	0	0.0	12.000	9.000	0
238	0	0	0	0	0	0	0.0	13.000	9.000	0
239	0	0	0	0	0	0	0.0	14.000	9.000	0
240	0	0	0	0	0	0	0.0	15.000	9.000	0
241	0	0	0	0	0	0	0.0	16.000	9.000	0
242	0	0	0	0	0	0	0.0	17.000	9.000	0
243	0	0	0	0	0	0	0.0	18.000	9.000	0
244	0	0	0	0	0	0	0.0	19.000	9.000	0
245	0	0	0	0	0	0	0.0	20.000	9.000	0
246	0	0	0	0	0	0	0.0	0.0	7.500	0
247	0	0	0	0	0	0	0.0	2.000	7.500	0
248	0	0	0	0	0	0	0.0	4.000	7.500	0
249	0	0	0	0	0	0	0.0	6.000	7.500	0
250	0	0	0	0	0	0	0.0	8.000	7.500	0
251	0	0	0	0	0	0	0.0	10.000	7.500	0
252	0	0	0	0	0	0	0.0	12.000	7.500	0
253	0	0	0	0	0	0	0.0	14.000	7.500	0
254	0	0	0	0	0	0	0.0	16.000	7.500	0
255	0	0	0	0	0	0	0.0	18.000	7.500	0
256	0	0	0	0	0	0	0.0	20.000	7.500	0
257	0	0	0	0	0	0	0.0	0.0	6.000	0
258	0	0	0	0	0	0	0.0	1.000	6.000	0
259	0	0	0	0	0	0	0.0	2.000	6.000	0
260	0	0	0	0	0	0	0.0	3.000	6.000	0
261	0	0	0	0	0	0	0.0	4.000	6.000	0
262	0	0	0	0	0	0	0.0	5.000	6.000	0

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263	0	0	0	0	0	0	0.0	6.000	6.000	0
264	0	0	0	0	0	0	0.0	7.000	6.000	0
265	0	0	0	0	0	0	0.0	8.000	6.000	0
266	0	0	0	0	0	0	0.0	9.000	6.000	0
267	0	0	0	0	0	0	0.0	10.000	6.000	0
268	0	0	0	0	0	0	0.0	11.000	6.000	0
269	0	0	0	0	0	0	0.0	12.000	6.000	0
270	0	0	0	0	0	0	0.0	13.000	6.000	0
271	0	0	0	0	0	0	0.0	14.000	6.000	0
272	0	0	0	0	0	0	0.0	15.000	6.000	0
273	0	0	0	0	0	0	0.0	16.000	6.000	0
274	0	0	0	0	0	0	0.0	17.000	6.000	0
275	0	0	0	0	0	0	0.0	18.000	6.000	0
276	0	0	0	0	0	0	0.0	19.000	6.000	0
277	0	0	0	0	0	0	0.0	20.000	6.000	0
278	0	0	0	0	0	0	0.0	0.0	5.000	0
279	0	0	0	0	0	0	0.0	2.000	5.000	0
280	0	0	0	0	0	0	0.0	4.000	5.000	0
281	0	0	0	0	0	0	0.0	6.000	5.000	0
282	0	0	0	0	0	0	0.0	8.000	5.000	0
283	0	0	0	0	0	0	0.0	10.000	5.000	0
284	0	0	0	0	0	0	0.0	12.000	5.000	0
285	0	0	0	0	0	0	0.0	14.000	5.000	0
286	0	0	0	0	0	0	0.0	16.000	5.000	0
287	0	0	0	0	0	0	0.0	18.000	5.000	0
288	0	0	0	0	0	0	0.0	20.000	5.000	0
289	0	0	0	0	0	0	0.0	0.0	4.000	0
290	0	0	0	0	0	0	0.0	1.000	4.000	0
291	0	0	0	0	0	0	0.0	2.000	4.000	0
292	0	0	0	0	0	0	0.0	3.000	4.000	0
293	0	0	0	0	0	0	0.0	4.000	4.000	0
294	0	0	0	0	0	0	0.0	5.000	4.000	0
295	0	0	0	0	0	0	0.0	6.000	4.000	0
296	0	0	0	0	0	0	0.0	7.000	4.000	0
297	0	0	0	0	0	0	0.0	8.000	4.000	0
298	0	0	0	0	0	0	0.0	9.000	4.000	0
299	0	0	0	0	0	0	0.0	10.000	4.000	0
300	0	0	0	0	0	0	0.0	11.000	4.000	0
301	0	0	0	0	0	0	0.0	12.000	4.000	0
302	0	0	0	0	0	0	0.0	13.000	4.000	0
303	0	0	0	0	0	0	0.0	14.000	4.000	0
304	0	0	0	0	0	0	0.0	15.000	4.000	0
305	0	0	0	0	0	0	0.0	16.000	4.000	0
306	0	0	0	0	0	0	0.0	17.000	4.000	0
307	0	0	0	0	0	0	0.0	18.000	4.000	0
308	0	0	0	0	0	0	0.0	19.000	4.000	0
309	0	0	0	0	0	0	0.0	20.000	4.000	0
310	0	0	0	0	0	0	0.0	0.0	3.000	0
311	0	0	0	0	0	0	0.0	2.000	3.000	0
312	0	0	0	0	0	0	0.0	4.000	3.000	0
313	0	0	0	0	0	0	0.0	6.000	3.000	0
314	0	0	0	0	0	0	0.0	8.000	3.000	0
315	0	0	0	0	0	0	0.0	10.000	3.000	0
316	0	0	0	0	0	0	0.0	12.000	3.000	0
317	0	0	0	0	0	0	0.0	14.000	3.000	0
318	0	0	0	0	0	0	0.0	16.000	3.000	0
319	0	0	0	0	0	0	0.0	18.000	3.000	0
320	0	0	0	0	0	0	0.0	20.000	3.000	0
321	0	0	0	0	0	0	0.0	0.0	2.000	0
322	0	0	0	0	0	0	0.0	1.000	2.000	0
323	0	0	0	0	0	0	0.0	2.000	2.000	0
324	0	0	0	0	0	0	0.0	3.000	2.000	0
325	0	0	0	0	0	0	0.0	4.000	2.000	0
326	0	0	0	0	0	0	0.0	5.000	2.000	0
327	0	0	0	0	0	0	0.0	6.000	2.000	0
328	0	0	0	0	0	0	0.0	7.000	2.000	0
329	0	0	0	0	0	0	0.0	8.000	2.000	0
330	0	0	0	0	0	0	0.0	9.000	2.000	0

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331	0	0	0	0	0	0	0.0	10.000	2.000	0
332	0	0	0	0	0	0	0.0	11.000	2.000	0
333	0	0	0	0	0	0	0.0	12.000	2.000	0
334	0	0	0	0	0	0	0.0	13.000	2.000	0
335	0	0	0	0	0	0	0.0	14.000	2.000	0
336	0	0	0	0	0	0	0.0	15.000	2.000	0
337	0	0	0	0	0	0	0.0	16.000	2.000	0
338	0	0	0	0	0	0	0.0	17.000	2.000	0
339	0	0	0	0	0	0	0.0	18.000	2.000	0
340	0	0	0	0	0	0	0.0	19.000	2.000	0
341	0	0	0	0	0	0	0.0	20.000	2.000	0
342	0	0	0	0	0	0	0.0	0.0	1.000	0
343	0	0	0	0	0	0	0.0	2.000	1.000	0
344	0	0	0	0	0	0	0.0	4.000	1.000	0
345	0	0	0	0	0	0	0.0	6.000	1.000	0
346	0	0	0	0	0	0	0.0	8.000	1.000	0
347	0	0	0	0	0	0	0.0	9.500	0.500	0
348	0	0	0	0	0	0	0.0	10.000	0.500	0
349	0	0	0	0	0	0	0.0	10.500	0.500	0
350	0	0	0	0	0	0	0.0	12.000	1.000	0
351	0	0	0	0	0	0	0.0	14.000	1.000	0
352	0	0	0	0	0	0	0.0	16.000	1.000	0
353	0	0	0	0	0	0	0.0	18.500	1.000	0
354	0	0	0	0	0	0	0.0	20.000	1.300	0
355	0	0	1	0	0	0	0.0	0.0	0.0	0
356	0	0	1	0	0	0	0.0	1.000	0.0	0
357	0	0	1	0	0	0	0.0	2.000	0.0	0
358	0	0	1	0	0	0	0.0	3.000	0.0	0
359	0	0	1	0	0	0	0.0	4.000	0.0	0
360	0	0	1	0	0	0	0.0	5.000	0.0	0
361	0	0	1	0	0	0	0.0	6.000	0.0	0
362	0	0	1	0	0	0	0.0	7.000	0.0	0
363	0	0	1	0	0	0	0.0	8.000	0.0	0
364	0	0	1	0	0	0	0.0	9.500	0.0	0
365	0	0	1	0	0	0	0.0	10.000	0.0	0
366	0	0	1	0	0	0	0.0	10.000	0.0	0
367	0	0	1	0	0	0	0.0	10.000	0.0	0
368	0	0	1	0	0	0	0.0	10.000	0.0	0
369	0	0	1	0	0	0	0.0	10.000	0.0	0
370	0	0	1	0	0	0	0.0	10.000	0.0	0
371	0	0	1	0	0	0	0.0	10.000	0.0	0
372	0	0	1	0	0	0	0.0	10.000	0.0	0
373	0	0	1	0	0	0	0.0	10.000	0.0	0
374	0	0	0	0	0	0	0.0	10.500	0.0	0
375	0	0	0	0	0	0	0.0	12.000	0.0	0
376	0	0	0	0	0	0	0.0	13.000	0.0	0
377	0	0	0	0	0	0	0.0	14.000	0.0	0
378	0	0	0	0	0	0	0.0	15.000	0.0	0
379	0	0	0	0	0	0	0.0	16.000	0.0	0
380	0	0	0	0	0	0	0.0	17.500	0.0	0
381	0	0	0	0	0	0	0.0	19.000	0.0	0
382	0	0	0	0	0	0	0.0	19.500	0.288	0
383	0	0	0	0	0	0	0.0	20.000	0.577	0

GENERATED NODAL DATA

NODE	BOUNDARY CONDITION CODES						NODAL POINT COORDINATES			THICKNESS
	X	Y	Z	XX	YY	ZZ	X	Y	Z	
1	1	1	0	1	1	1	0.0	0.0	40.000	
2	1	0	0	1	1	1	0.0	1.000	40.000	
3	1	0	0	1	1	1	0.0	2.000	40.000	
4	1	0	0	1	1	1	0.0	3.000	40.000	
5	1	0	0	1	1	1	0.0	4.000	40.000	
6	1	0	0	1	1	1	0.0	5.000	40.000	
7	1	0	0	1	1	1	0.0	6.000	40.000	

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8	1	0	0	1	1	1	0.0	7.000	40.000
9	1	0	0	1	1	1	0.0	8.000	40.000
10	1	0	0	1	1	1	0.0	9.000	40.000
11	1	0	0	1	1	1	0.0	10.000	40.000
12	1	0	0	1	1	1	0.0	11.000	40.000
13	1	0	0	1	1	1	0.0	12.000	40.000
14	1	0	0	1	1	1	0.0	13.000	40.000
15	1	0	0	1	1	1	0.0	14.000	40.000
16	1	0	0	1	1	1	0.0	15.000	40.000
17	1	0	0	1	1	1	0.0	16.000	40.000
18	1	0	0	1	1	1	0.0	17.000	40.000
19	1	0	0	1	1	1	0.0	18.000	40.000
20	1	0	0	1	1	1	0.0	19.000	40.000
21	1	0	0	1	1	1	0.0	20.000	37.000
22	1	0	0	1	1	1	0.0	0.0	37.000
23	1	0	0	1	1	1	0.0	2.000	37.000
24	1	0	0	1	1	1	0.0	4.000	37.000
25	1	0	0	1	1	1	0.0	6.000	37.000
26	1	0	0	1	1	1	0.0	8.000	37.000
27	1	0	0	1	1	1	0.0	10.000	37.000
28	1	0	0	1	1	1	0.0	12.000	37.000
29	1	0	0	1	1	1	0.0	14.000	37.000
30	1	0	0	1	1	1	0.0	16.000	37.000
31	1	0	0	1	1	1	0.0	18.000	37.000
32	1	0	0	1	1	1	0.0	20.000	37.000
33	1	0	0	1	1	1	0.0	0.0	34.000
34	1	0	0	1	1	1	0.0	1.000	34.000
35	1	0	0	1	1	1	0.0	2.000	34.000
36	1	0	0	1	1	1	0.0	3.000	34.000
37	1	0	0	1	1	1	0.0	4.000	34.000
38	1	0	0	1	1	1	0.0	5.000	34.000
39	1	0	0	1	1	1	0.0	6.000	34.000
40	1	0	0	1	1	1	0.0	7.000	34.000
41	1	0	0	1	1	1	0.0	8.000	34.000
42	1	0	0	1	1	1	0.0	9.000	34.000
43	1	0	0	1	1	1	0.0	10.000	34.000
44	1	0	0	1	1	1	0.0	11.000	34.000
45	1	0	0	1	1	1	0.0	12.000	34.000
46	1	0	0	1	1	1	0.0	13.000	34.000
47	1	0	0	1	1	1	0.0	14.000	34.000
48	1	0	0	1	1	1	0.0	15.000	34.000
49	1	0	0	1	1	1	0.0	16.000	34.000
50	1	0	0	1	1	1	0.0	17.000	34.000
51	1	0	0	1	1	1	0.0	18.000	34.000
52	1	0	0	1	1	1	0.0	19.000	34.000
53	1	0	0	1	1	1	0.0	20.000	34.000
54	1	0	0	1	1	1	0.0	0.0	31.000
55	1	0	0	1	1	1	0.0	2.000	31.000
56	1	0	0	1	1	1	0.0	4.000	31.000
57	1	0	0	1	1	1	0.0	6.000	31.000
58	1	0	0	1	1	1	0.0	8.000	31.000
59	1	0	0	1	1	1	0.0	10.000	31.000
60	1	0	0	1	1	1	0.0	12.000	31.000
61	1	0	0	1	1	1	0.0	14.000	31.000
62	1	0	0	1	1	1	0.0	16.000	31.000
63	1	0	0	1	1	1	0.0	18.000	31.000
64	1	0	0	1	1	1	0.0	20.000	31.000
65	1	0	0	1	1	1	0.0	0.0	28.000
66	1	0	0	1	1	1	0.0	1.000	28.000
67	1	0	0	1	1	1	0.0	2.000	28.000
68	1	0	0	1	1	1	0.0	3.000	28.000
69	1	0	0	1	1	1	0.0	4.000	28.000
70	1	0	0	1	1	1	0.0	5.000	28.000
71	1	0	0	1	1	1	0.0	6.000	28.000
72	1	0	0	1	1	1	0.0	7.000	28.000
73	1	0	0	1	1	1	0.0	8.000	28.000
74	1	0	0	1	1	1	0.0	9.000	28.000
75	1	0	0	1	1	1	0.0	10.000	28.000

(B.2)

76	1	0	0	1	1	1	0.0	11.000	28.000
77	1	0	0	1	1	1	0.0	12.000	28.000
78	1	0	0	1	1	1	0.0	13.000	28.000
79	1	0	0	1	1	1	0.0	14.000	28.000
80	1	0	0	1	1	1	0.0	15.000	28.000
81	1	0	0	1	1	1	0.0	16.000	28.000
82	1	0	0	1	1	1	0.0	17.000	28.000
83	1	0	0	1	1	1	0.0	18.000	28.000
dU	1	0	0	1	1	1	0.0	19.000	28.000
85	1	0	0	1	1	1	0.0	20.000	28.000
8a	1	0	0	1	1	1	0.0	0.0	25.000
87	1	0	0	1	1	1	0.0	2.000	25.000
b8	1	0	0	1	1	1	0.0	4.000	25.000
89	1	0	0	1	1	1	0.0	6.000	25.000
90	1	0	0	1	1	1	0.0	8.000	25.000
91	1	0	0	1	1	1	0.0	10.000	25.000
92	1	0	0	1	1	1	0.0	12.000	25.000
33	1	0	0	1	1	1	0.0	14.000	25.000
94	1	0	0	1	1	1	0.0	16.000	25.000
95	1	0	0	1	1	1	0.0	18.000	25.000
Y6	1	0	0	1	1	1	0.0	20.000	25.000
97	1	0	0	1	1	1	0.0	0.0	22.000
98	1	0	0	1	1	1	0.0	1.000	22.000
99	1	0	0	1	1	1	0.0	2.000	22.000
100	1	0	0	1	1	1	0.0	3.000	22.000
101	1	0	0	1	1	1	0.0	4.000	22.000
102	1	0	0	1	1	1	0.0	5.000	22.000
153	1	0	0	1	1	1	0.0	6.000	22.000
104	1	0	0	1	1	1	0.0	7.000	22.000
105	1	0	0	1	1	1	0.0	8.000	22.000
106	1	0	0	1	1	1	0.0	9.000	22.000
107	1	0	0	1	1	1	0.0	10.000	22.000
108	1	0	0	1	1	1	0.0	11.000	22.000
109	1	0	0	1	1	1	0.0	12.000	22.000
110	1	0	0	1	1	1	0.0	13.000	22.000
111	1	0	0	1	1	1	0.0	14.000	22.000
112	1	0	0	1	1	1	0.0	15.000	22.000
113	1	0	0	1	1	1	0.0	16.000	22.000
114	1	0	0	1	1	1	0.0	17.000	22.000
115	1	0	0	1	1	1	0.0	18.000	22.000
116	1	0	0	1	1	1	0.0	19.000	22.000
117	1	0	0	1	1	1	0.0	20.000	22.000
118	1	0	0	1	1	1	0.0	0.0	20.000
119	1	0	0	1	1	1	0.0	2.000	20.000
120	1	0	0	1	1	1	0.0	4.000	20.000
121	1	0	0	1	1	1	0.0	6.000	20.000
122	1	0	0	1	1	1	0.0	8.000	20.000
123	1	0	0	1	1	1	0.0	10.000	20.000
124	1	0	0	1	1	1	0.0	12.000	20.000
175	1	0	0	1	1	1	0.0	14.000	20.000
116	1	0	0	1	1	1	0.0	16.000	20.000
117	1	0	0	1	1	1	0.0	18.000	20.000
128	1	0	0	1	1	1	0.0	20.000	20.000
129	1	0	0	1	1	1	0.0	0.0	18.000
130	1	0	0	1	1	1	0.0	1.000	18.000
131	1	0	0	1	1	1	0.0	2.000	18.000
132	1	0	0	1	1	1	0.0	3.000	18.000
133	1	0	0	1	1	1	0.0	4.000	18.000
13U	1	0	0	1	1	1	0.0	5.000	18.000
135	1	0	0	1	1	1	0.0	6.000	18.000
136	1	0	0	1	1	1	0.0	7.000	18.000
137	1	0	0	1	1	1	0.0	8.000	18.000
138	1	0	0	1	1	1	0.0	9.000	18.000
139	1	0	0	1	1	1	0.0	10.000	18.000
140	1	0	0	1	1	1	0.0	11.000	18.000
141	1	0	0	1	1	1	0.0	12.000	18.000
142	1	0	0	1	1	1	0.0	13.000	18.000
143	1	0	0	1	1	1	0.0	14.000	18.000

144	1	0	0	1	1	1	0.0	15.000	18.000
145	1	0	0	1	1	1	0.0	16.000	18.000
146	1	0	0	1	1	1	0.0	17.000	18.000
147	1	0	0	1	1	1	0.0	18.000	18.000
148	1	0	0	1	1	1	0.0	19.000	18.000
149	1	0	0	1	1	1	0.0	20.000	18.000
150	1	0	0	1	1	1	0.0	0.0	16.500
151	1	0	0	1	1	1	0.0	2.000	16.500
152	1	0	0	1	1	1	0.0	4.000	16.500
153	1	0	0	1	1	1	0.0	6.000	16.500
154	1	0	0	1	1	1	0.0	8.000	16.500
155	1	0	0	1	1	1	0.0	10.000	16.500
156	1	0	0	1	1	1	0.0	12.000	16.500
157	1	0	0	1	1	1	0.0	14.000	16.500
158	1	0	0	1	1	1	0.0	16.000	16.500
159	1	0	0	1	1	1	0.0	18.000	16.500
160	1	0	0	1	1	1	0.0	20.000	16.500
161	1	0	0	1	1	1	0.0	0.0	15.000
162	1	0	0	1	1	1	0.0	1.000	15.000
163	1	0	0	1	1	1	0.0	2.000	15.000
164	1	0	0	1	1	1	0.0	3.000	15.000
165	1	0	0	1	1	1	0.0	4.000	15.000
166	1	0	0	1	1	1	0.0	5.000	15.000
167	1	0	0	1	1	1	0.0	6.000	15.000
168	1	0	0	1	1	1	0.0	7.000	15.000
169	1	0	0	1	1	1	0.0	8.000	15.000
170	1	0	0	1	1	1	0.0	9.000	15.000
171	1	0	0	1	1	1	0.0	10.000	15.000
172	1	0	0	1	1	1	0.0	11.000	15.000
173	1	0	0	1	1	1	0.0	12.000	15.000
174	1	0	0	1	1	1	0.0	13.000	15.000
175	1	0	0	1	1	1	0.0	14.000	15.000
176	1	0	0	1	1	1	0.0	15.000	15.000
177	1	0	0	1	1	1	0.0	16.000	15.000
178	1	0	0	1	1	1	0.0	17.000	15.000
179	1	0	0	1	1	1	0.0	18.000	15.000
180	1	0	0	1	1	1	0.0	19.000	15.000
181	1	0	0	1	1	1	0.0	20.000	15.000
182	1	0	0	1	1	1	0.0	0.0	13.500
183	1	0	0	1	1	1	0.0	2.000	13.500
184	1	0	0	1	1	1	0.0	4.000	13.500
185	1	0	0	1	1	1	0.0	6.000	13.500
186	1	0	0	1	1	1	0.0	8.000	13.500
187	1	0	0	1	1	1	0.0	10.000	13.500
188	1	0	0	1	1	1	0.0	12.000	13.500
189	1	0	0	1	1	1	0.0	14.000	13.500
190	1	0	0	1	1	1	0.0	16.000	13.500
191	1	0	0	1	1	1	0.0	18.000	13.500
192	1	0	0	1	1	1	0.0	20.000	13.500
193	1	0	0	1	1	1	0.0	0.0	12.000
194	1	0	0	1	1	1	0.0	1.000	12.000
195	1	0	0	1	1	1	0.0	2.000	12.000
196	1	0	0	1	1	1	0.0	3.000	12.000
197	1	0	0	1	1	1	0.0	4.000	12.000
198	1	0	0	1	1	1	0.0	5.000	12.000
199	1	0	0	1	1	1	0.0	6.000	12.000
200	1	0	0	1	1	1	0.0	7.000	12.000
201	1	0	0	1	1	1	0.0	8.000	12.000
202	1	0	0	1	1	1	0.0	9.000	12.000
203	1	0	0	1	1	1	0.0	10.000	12.000
204	1	0	0	1	1	1	0.0	11.000	12.000
205	1	0	0	1	1	1	0.0	12.000	12.000
206	1	0	0	1	1	1	0.0	13.000	12.000
207	1	0	0	1	1	1	0.0	14.000	12.000
208	1	0	0	1	1	1	0.0	15.000	12.000
209	1	0	0	1	1	1	0.0	16.000	12.000
210	1	0	0	1	1	1	0.0	17.000	12.000
211	1	0	0	1	1	1	0.0	18.000	12.000

212	1	0	0	1	1	1	0.0	19.000	12.000
213	1	0	0	1	1	1	0.0	20.000	12.000
214	1	0	0	1	1	1	0.0	0.0	10.500
215	1	0	0	1	1	1	0.0	2.000	10.500
216	1	0	0	1	1	1	0.0	4.000	10.500
217	1	0	0	1	1	1	0.0	6.000	10.500
218	1	0	0	1	1	1	0.0	8.000	10.500
219	1	0	0	1	1	1	0.0	10.000	10.500
220	1	0	0	1	1	1	0.0	12.000	10.500
221	1	0	0	1	1	1	0.0	14.000	10.500
222	1	0	0	1	1	1	0.0	16.000	10.500
223	1	0	0	1	1	1	0.0	18.000	10.500
224	1	0	0	1	1	1	0.0	20.000	10.500
225	1	0	0	1	1	1	0.0	0.0	9.000
226	1	0	0	1	1	1	0.0	1.000	9.000
227	1	0	0	1	1	1	0.0	2.000	9.000
228	1	0	0	1	1	1	0.0	3.000	9.000
229	1	0	0	1	1	1	0.0	4.000	9.000
230	1	0	0	1	1	1	0.0	5.000	9.000
231	1	0	0	1	1	1	0.0	6.000	9.000
232	1	0	0	1	1	1	0.0	7.000	9.000
233	1	0	0	1	1	1	0.0	8.000	9.000
234	1	0	0	1	1	1	0.0	9.000	9.000
235	1	0	0	1	1	1	0.0	10.000	9.000
236	1	0	0	1	1	1	0.0	11.000	9.000
237	1	0	0	1	1	1	0.0	12.000	9.000
238	1	0	0	1	1	1	0.0	13.000	9.000
239	1	0	0	1	1	1	0.0	14.000	9.000
240	1	0	0	1	1	1	0.0	15.000	9.000
241	1	0	0	1	1	1	0.0	16.000	9.000
242	1	0	0	1	1	1	0.0	17.000	9.000
243	1	0	0	1	1	1	0.0	18.000	9.000
244	1	0	0	1	1	1	0.0	19.000	9.000
245	1	0	0	1	1	1	0.0	20.000	9.000
246	1	0	0	1	1	1	0.0	0.0	7.500
247	1	0	0	1	1	1	0.0	2.000	7.500
248	1	0	0	1	1	1	0.0	4.000	7.500
249	1	0	0	1	1	1	0.0	6.000	7.500
250	1	0	0	1	1	1	0.0	8.000	7.500
251	1	0	0	1	1	1	0.0	10.000	7.500
252	1	0	0	1	1	1	0.0	12.000	7.500
253	1	0	0	1	1	1	0.0	14.000	7.500
254	1	0	0	1	1	1	0.0	16.000	7.500
255	1	0	0	1	1	1	0.0	18.000	7.500
256	1	0	0	1	1	1	0.0	20.000	7.500
257	1	0	0	1	1	1	0.0	0.0	6.000
258	1	0	0	1	1	1	0.0	1.000	6.000
259	1	0	0	1	1	1	0.0	2.000	6.000
260	1	0	0	1	1	1	0.0	3.000	6.000
261	1	0	0	1	1	1	0.0	4.000	6.000
262	1	0	0	1	1	1	0.0	5.000	6.000
263	1	0	0	1	1	1	0.0	6.000	6.000
264	1	0	0	1	1	1	0.0	7.000	6.000
265	1	0	0	1	1	1	0.0	8.000	6.000
266	1	0	0	1	1	1	0.0	9.000	6.000
267	1	0	0	1	1	1	0.0	10.000	6.000
268	1	0	0	1	1	1	0.0	11.000	6.000
269	1	0	0	1	1	1	0.0	12.000	6.000
270	1	0	0	1	1	1	0.0	13.000	6.000
271	1	0	0	1	1	1	0.0	14.000	6.000
272	1	0	0	1	1	1	0.0	15.000	6.000
273	1	0	0	1	1	1	0.0	16.000	6.000
274	1	0	0	1	1	1	0.0	17.000	6.000
275	1	0	0	1	1	1	0.0	18.000	6.000
276	1	0	0	1	1	1	0.0	19.000	6.000
277	1	0	0	1	1	1	0.0	20.000	6.000
278	1	0	0	1	1	1	0.0	0.0	5.000
279	1	0	0	1	1	1	0.0	2.000	5.000

280	1	0	0	1	1	1	0.0	4.000	5.000
281	1	0	0	1	1	1	0.0	6.000	5.000
282	1	0	0	1	1	1	0.0	8.000	5.000
283	1	0	0	1	1	1	0.0	10.000	5.000
284	1	0	0	1	1	1	0.0	12.000	5.000
285	1	0	0	1	1	1	0.0	14.000	5.000
286	1	0	0	1	1	1	0.0	16.000	5.000
287	1	0	0	1	1	1	0.0	18.000	5.000
288	1	0	0	1	1	1	0.0	20.000	5.000
289	1	0	0	1	1	1	0.0	0.0	4.000
290	1	0	0	1	1	1	0.0	1.000	4.000
291	1	0	0	1	1	1	0.0	2.000	4.000
292	1	0	0	1	1	1	0.0	3.000	4.000
293	1	0	0	1	1	1	0.0	4.000	4.000
294	1	0	0	1	1	1	0.0	5.000	4.000
295	1	0	0	1	1	1	0.0	6.000	4.000
296	1	0	0	1	1	1	0.0	7.000	4.000
297	1	0	0	1	1	1	0.0	8.000	4.000
298	1	0	0	1	1	1	0.0	9.000	4.000
299	1	0	0	1	1	1	0.0	10.000	4.000
300	1	0	0	1	1	1	0.0	11.000	4.000
301	1	0	0	1	1	1	0.0	12.000	4.000
302	1	0	0	1	1	1	0.0	13.000	4.000
303	1	0	0	1	1	1	0.0	14.000	4.000
304	1	0	0	1	1	1	0.0	15.000	4.000
305	1	0	0	1	1	1	0.0	16.000	4.000
306	1	0	0	1	1	1	0.0	17.000	4.000
307	1	0	0	1	1	1	0.0	18.000	4.000
308	1	0	0	1	1	1	0.0	19.000	4.000
309	1	0	0	1	1	1	0.0	20.000	4.000
310	1	0	0	1	1	1	0.0	0.0	3.000
311	1	0	0	1	1	1	0.0	2.000	3.000
312	1	0	0	1	1	1	0.0	4.000	3.000
313	1	0	0	1	1	1	0.0	6.000	3.000
314	1	0	0	1	1	1	0.0	8.000	3.000
315	1	0	0	1	1	1	0.0	10.000	3.000
316	1	0	0	1	1	1	0.0	12.000	3.000
317	1	0	0	1	1	1	0.0	14.000	3.000
318	1	0	0	1	1	1	0.0	16.000	3.000
319	1	0	0	1	1	1	0.0	18.000	3.000
320	1	0	0	1	1	1	0.0	20.000	3.000
321	1	0	0	1	1	1	0.0	0.0	2.000
322	1	0	0	1	1	1	0.0	1.000	2.000
323	1	0	0	1	1	1	0.0	2.000	2.000
324	1	0	0	1	1	1	0.0	3.000	2.000
325	1	0	0	1	1	1	0.0	4.000	2.000
326	1	0	0	1	1	1	0.0	5.000	2.000
327	1	0	0	1	1	1	0.0	6.000	2.000
328	1	0	0	1	1	1	0.0	7.000	2.000
329	1	0	0	1	1	1	0.0	8.000	2.000
330	1	0	0	1	1	1	0.0	9.000	2.000
331	1	0	0	1	1	1	0.0	10.000	2.000
332	1	0	0	1	1	1	0.0	11.000	2.000
333	1	0	0	1	1	1	0.0	12.000	2.000
334	1	0	0	1	1	1	0.0	13.000	2.000
335	1	0	0	1	1	1	0.0	14.000	2.000
336	1	0	0	1	1	1	0.0	15.000	2.000
337	1	0	0	1	1	1	0.0	16.000	2.000
338	1	0	0	1	1	1	0.0	17.000	2.000
339	1	0	0	1	1	1	0.0	18.000	2.000
340	1	0	0	1	1	1	0.0	19.000	2.000
341	1	0	0	1	1	1	0.0	20.000	2.000
342	1	0	0	1	1	1	0.0	0.0	1.000
343	1	0	0	1	1	1	0.0	2.000	1.000
344	1	0	0	1	1	1	0.0	4.000	1.000
345	1	0	0	1	1	1	0.0	6.000	1.000
346	1	0	0	1	1	1	0.0	8.000	1.000
347	1	0	0	1	1	1	0.0	9.500	0.500

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348	1	0	0	1	1	1	0.0	10.000	0.500
349	1	0	0	1	1	1	0.0	10.500	0.500
350	1	0	0	1	1	1	0.0	12.000	1.000
351	1	0	0	1	1	1	0.0	14.000	1.000
352	1	0	0	1	1	1	0.0	16.000	1.000
353	1	0	0	1	1	1	0.0	18.500	1.000
354	1	0	0	1	1	1	0.0	20.000	1.300
355	1	0	1	1	1	1	0.0	0.0	0.0
356	1	0	1	1	1	1	0.0	1.000	0.0
357	1	0	1	1	1	1	0.0	2.000	0.0
358	1	0	1	1	1	1	0.0	3.000	0.0
359	1	0	1	1	1	1	0.0	4.000	0.0
360	1	0	1	1	1	1	0.0	5.000	0.0
361	1	0	1	1	1	1	0.0	6.000	0.0
362	1	0	1	1	1	1	0.0	7.000	0.0
363	1	0	1	1	1	1	0.0	8.000	0.0
364	1	0	1	1	1	1	0.0	9.500	0.0
365	1	0	1	1	1	1	0.0	10.000	0.0
366	1	0	1	1	1	1	0.0	10.000	0.0
367	1	0	1	1	1	1	0.0	10.000	0.0
368	1	0	1	1	1	1	0.0	10.000	0.0
369	1	0	1	1	1	1	0.0	10.000	0.0
370	1	0	1	1	1	1	0.0	10.000	0.0
371	1	0	1	1	1	1	0.0	10.000	0.0
372	1	0	1	1	1	1	0.0	10.000	0.0
373	1	0	1	1	1	1	0.0	10.000	0.0
374	1	0	0	1	1	1	0.0	10.500	0.0
375	1	0	0	1	1	1	0.0	12.000	0.0
376	1	0	0	1	1	1	0.0	13.000	0.0
377	1	0	0	1	1	1	0.0	14.000	0.0
378	1	0	0	1	1	1	0.0	15.000	0.0
379	1	0	0	1	1	1	0.0	16.000	0.0
380	1	0	0	1	1	1	0.0	17.500	0.0
381	1	0	0	1	1	1	0.0	19.000	0.0
382	1	0	0	1	1	1	0.0	19.500	0.288
383	1	0	0	1	1	1	0.0	20.000	0.57

EQUATION NUMBERS

N	X	Y	Z	XX	YY	ZZ
1	0	0	1	0	0	0
2	0	2	3	0	0	0
3	0	4	5	0	0	0
4	0	6	7	0	0	0
5	0	8	9	0	0	0
6	0	10	11	0	0	0
7	0	12	13	0	0	0
8	0	14	15	0	0	0
9	0	16	17	0	0	0
10	0	18	19	0	0	0
11	0	20	21	0	0	0
12	0	22	23	0	0	0
13	0	24	25	0	0	0
14	0	26	27	0	0	0
15	0	28	29	0	0	0
16	0	30	31	0	0	0
17	0	32	33	0	0	0
18	0	34	35	0	0	0
19	0	36	37	0	0	0
20	0	38	39	0	0	0
21	0	40	41	0	0	0
22	0	42	43	0	0	0
23	0	44	45	0	0	0
24	0	46	47	0	0	0
25	0	48	49	0	0	0

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26	0	50	51	0	0	0
27	0	52	53	0	0	0
28	0	54	55	0	0	0
29	0	56	57	0	0	0
30	0	58	59	0	0	0
31	0	60	61	0	0	0
32	0	62	63	0	0	0
33	0	64	65	0	0	0
34	0	66	67	0	0	0
35	0	68	69	0	0	0
36	0	70	71	0	0	0
37	0	72	73	0	0	0
38	0	74	75	0	0	0
39	0	76	77	0	0	0
40	0	78	79	0	0	0
41	0	80	81	0	0	0
42	0	82	83	0	0	0
43	0	84	85	0	0	0
44	0	86	87	0	0	0
45	0	88	89	0	0	0
46	0	90	91	0	0	0
47	0	92	93	0	0	0
48	0	94	95	0	0	0
49	0	96	97	0	0	0
50	0	98	99	0	0	0
51	0	100	101	0	0	0
52	0	102	103	0	0	0
53	0	104	105	0	0	0
54	0	106	107	0	0	0
55	0	108	109	0	0	0
56	0	110	111	0	0	0
57	0	112	113	0	0	0
58	0	114	115	0	0	0
59	0	116	117	0	0	0
60	0	118	119	0	0	0
61	0	120	121	0	0	0
62	0	122	123	0	0	0
63	0	124	125	0	0	0
64	0	126	127	0	0	0
65	0	128	129	0	0	0
66	0	130	131	0	0	0
67	0	132	133	0	0	0
68	0	134	135	0	0	0
69	0	136	137	0	0	0
70	0	138	139	0	0	0
71	0	140	141	0	0	0
72	0	142	143	0	0	0
73	0	144	145	0	0	0
74	0	146	147	0	0	0
75	0	148	149	0	0	0
76	0	150	151	0	0	0
77	0	152	153	0	0	0
78	0	154	155	0	0	0
79	0	156	157	0	0	0
80	0	158	159	0	0	0
81	0	160	161	0	0	0
82	0	162	163	0	0	0
83	0	164	165	0	0	0
84	0	166	167	0	0	0
85	0	168	169	0	0	0
86	0	170	171	0	0	0
87	0	172	173	0	0	0
88	0	174	175	0	0	0
89	0	176	177	0	0	0
90	0	178	179	0	0	0
91	0	180	181	0	0	0
92	0	182	183	0	0	0
93	0	184	185	0	0	0

(B.2)

94	0	136	187	0	0	0
95	0	188	189	0	0	0
96	0	190	191	0	0	0
97	0	192	193	0	0	0
98	0	194	195	0	0	0
99	0	136	197	0	0	0
100	0	198	199	0	0	0
151	0	230	201	0	0	0
102	0	232	203	0	0	0
103	0	204	205	0	0	0
104	0	206	207	0	0	0
105	0	233	209	0	0	0
136	0	210	211	0	0	0
137	0	212	213	0	0	0
108	0	214	215	0	0	0
109	0	216	217	0	0	0
110	0	218	219	0	0	0
111	0	220	221	0	0	0
112	0	222	223	0	0	0
113	0	224	225	0	0	0
114	0	226	227	0	0	0
115	0	226	229	0	0	0
11b	0	230	231	0	0	0
117	0	232	233	0	0	0
11a	0	23U	235	0	0	0
113	0	23o	237	0	0	0
123	0	238	239	0	0	0
121	0	240	241	0	0	0
122	0	242	243	0	0	0
1.23	0	244	245	0	0	0
12u	0	246	247	0	0	0
125	0	248	249	0	0	0
126	0	250	251	0	0	0
127	0	252	253	0	0	0
128	0	25U	255	0	0	0
129	0	256	257	0	0	0
130	0	258	259	0	0	0
131	0	260	261	0	0	0
132	0	262	263	0	0	0
133	0	264	265	0	0	0
13u	0	266	267	0	0	0
135	0	268	269	0	0	0
136	0	270	271	0	0	0
137	0	272	273	0	0	0
138	0	274	275	0	0	0
139	0	276	277	0	0	0
140	0	278	279	0	0	0
141	0	280	261	0	0	0
142	0	292	283	0	0	0
1U3	0	23U	285	0	0	0
144	0	286	287	0	0	0
145	0	2d8	289	0	0	0
146	0	290	291	0	0	0
147	0	292	293	0	0	0
148	0	294	295	0	0	0
149	0	236	297	0	0	0
150	0	236	299	0	0	0
151	0	300	301	0	0	0
152	0	302	303	0	0	0
153	0	304	305	0	0	0
154	0	356	307	0	0	0
155	0	309	309	0	0	0
156	0	310	311	0	0	0
157	0	312	313	0	0	0
158	0	314	315	0	0	0
159	0	316	317	0	0	0
160	0	318	319	0	0	0
161	0	320	321	0	0	0

162	0	322	323	0	0	0
163	0	324	325	0	0	0
164	0	326	327	0	0	0
165	0	328	329	0	0	0
166	0	330	331	0	0	0
167	0	332	333	0	0	0
168	0	334	335	0	0	0
169	0	336	337	0	0	0
170	0	338	339	0	0	0
171	0	340	341	0	0	0
172	0	342	343	0	0	0
173	0	344	345	0	0	0
174	0	346	347	0	0	0
175	0	348	349	0	0	0
176	0	350	351	0	0	0
177	0	352	353	0	0	0
178	0	354	355	0	0	0
179	0	356	357	0	0	0
180	0	358	359	0	0	0
181	0	360	361	0	0	0
182	0	362	363	0	0	0
183	0	364	365	0	0	0
184	0	366	367	0	0	0
185	0	368	369	0	0	0
186	0	370	371	0	0	0
187	0	372	373	0	0	0
188	0	374	375	0	0	0
189	0	376	377	0	0	0
190	0	378	379	0	0	0
191	0	380	381	0	0	0
192	0	382	383	0	0	0
193	0	384	385	0	0	0
194	0	386	387	0	0	0
195	0	388	389	0	0	0
196	0	390	391	0	0	0
197	0	392	393	0	0	0
198	0	394	395	0	0	0
199	0	396	397	0	0	0
200	0	398	399	0	0	0
201	0	400	401	0	0	0
202	0	402	403	0	0	0
203	0	404	405	0	0	0
204	0	406	407	0	0	0
205	0	408	409	0	0	0
206	0	410	411	0	0	0
207	0	412	413	0	0	0
208	0	414	415	0	0	0
209	0	416	417	0	0	0
210	0	418	419	0	0	0
211	0	420	421	0	0	0
212	0	422	423	0	0	0
213	0	424	425	0	0	0
214	0	426	427	0	0	0
215	0	428	429	0	0	0
216	0	430	431	0	0	0
217	0	432	433	0	0	0
218	0	434	435	0	0	0
219	0	436	437	0	0	0
220	0	438	439	0	0	0
221	0	440	441	0	0	0
222	0	442	443	0	0	0
223	0	444	445	0	0	0
224	0	446	447	0	0	0
225	0	448	449	0	0	0
226	0	450	451	0	0	0
227	0	452	453	0	0	0
228	0	454	455	0	0	0
229	0	456	457	0	0	0

(B.2)

230	0	458	459	0	0	0
231	0	460	461	0	0	0
232	0	462	463	0	0	0
233	0	464	465	0	0	0
234	0	466	467	0	0	0
235	0	468	469	0	0	0
236	0	470	471	0	0	0
237	0	472	473	0	0	0
23d	0	474	475	0	0	0
235	0	476	477	0	0	0
240	0	478	479	0	0	0
241	0	480	481	0	0	0
242	0	482	483	0	0	0
2U3	0	484	485	0	0	0
244	0	486	487	0	0	0
245	0	488	489	0	0	0
246	0	490	491	0	0	0
247	0	492	493	0	0	0
248	0	494	495	0	0	0
249	0	496	497	0	0	0
250	0	498	499	0	0	0
251	0	500	501	0	0	0
252	0	502	503	0	0	0
253	0	504	505	0	0	0
25U	0	506	507	0	0	0
255	0	508	509	0	0	0
256	0	510	511	0	0	0
257	0	512	513	0	0	0
258	0	514	515	0	0	0
259	0	516	517	0	0	0
260	0	518	519	0	0	0
261	0	520	521	0	0	0
262	0	522	523	0	0	0
263	0	524	525	0	0	0
264	0	526	527	0	0	0
265	0	528	529	0	0	0
266	0	530	531	0	0	0
2b7	0	532	533	0	0	0
268	0	534	535	0	0	0
269	0	536	537	0	0	0
270	0	538	539	0	0	0
271	0	540	541	0	0	0
272	0	542	543	0	0	0
273	0	544	545	0	0	0
274	0	546	547	0	0	0
275	0	548	549	0	0	0
276	0	550	551	0	0	0
277	0	552	553	0	0	0
278	0	554	555	0	0	0
279	0	556	557	0	0	0
280	0	558	559	0	0	0
'dl	0	560	561	0	0	0
282	0	562	563	0	0	0
2d3	0	564	565	0	0	0
2dU	0	566	567	0	0	0
285	0	568	569	0	0	0
286	0	570	571	0	0	0
287	0	572	573	0	0	0
288	0	574	575	0	0	0
289	0	576	577	0	0	0
290	0	578	579	0	0	0
291	0	580	581	0	0	0
292	0	582	583	0	0	0
293	0	584	585	0	0	0
23U	0	586	587	0	0	0
295	0	588	589	0	0	0
296	0	590	591	0	0	0
297	0	592	593	0	0	0

298	0	594	595	0	0	0
299	0	596	597	0	0	0
300	0	598	599	0	0	0
301	0	600	601	0	0	0
302	0	602	603	0	0	0
303	0	604	605	0	0	0
304	0	606	607	0	0	0
305	0	608	609	0	0	0
306	0	610	611	0	0	0
307	0	612	613	0	0	0
308	0	614	615	0	0	0
309	0	616	617	0	0	0
310	0	618	619	0	0	0
311	0	620	621	0	0	0
312	0	622	623	0	0	0
313	0	624	625	0	0	0
314	0	626	627	0	0	0
315	0	628	629	0	0	0
316	0	630	631	0	0	0
317	0	632	633	0	0	0
318	0	634	635	0	0	0
319	0	636	637	0	0	0
320	0	638	639	0	0	0
321	0	640	641	0	0	0
322	0	642	643	0	0	0
323	0	644	645	0	0	0
324	0	646	647	0	0	0
325	0	648	649	0	0	0
326	0	650	651	0	0	0
327	0	652	653	0	0	0
328	0	654	655	0	0	0
329	0	656	657	0	0	0
330	0	658	659	0	0	0
331	0	660	661	0	0	0
332	0	662	663	0	0	0
333	0	664	665	0	0	0
334	0	666	667	0	0	0
335	0	668	669	0	0	0
336	0	670	671	0	0	0
337	0	672	673	0	0	0
338	0	674	675	0	0	0
339	0	676	677	0	0	0
340	0	678	679	0	0	0
341	0	680	681	0	0	0
342	0	682	683	0	0	0
343	0	684	685	0	0	0
344	0	686	687	0	0	0
345	0	688	689	0	0	0
346	0	690	691	0	0	0
347	0	692	693	0	0	0
348	0	694	695	0	0	0
349	0	696	697	0	0	0
350	0	698	699	0	0	0
351	0	700	701	0	0	0
352	0	702	703	0	0	0
353	0	704	705	0	0	0
354	0	706	707	0	0	0
355	0	708	0	0	0	0
356	0	709	0	0	0	0
357	0	710	0	0	0	0
358	0	711	0	0	0	0
359	0	712	0	0	0	0
360	0	713	0	0	0	0
361	0	714	0	0	0	0
362	0	715	0	0	0	0
363	0	716	0	0	0	0
364	0	717	0	0	0	0
365	0	718	0	0	0	0

366	0	719	0	0	0	0
367	0	720	0	0	0	0
368	0	721	0	0	0	0
369	0	722	0	0	0	0
370	0	723	0	0	0	0
371	0	724	0	0	0	0
372	0	725	0	0	0	0
373	0	726	0	0	0	0
374	0	727	728	0	0	0
375	0	729	730	0	0	0
376	0	731	732	0	0	0
377	0	733	734	0	0	0
378	0	735	736	0	0	0
379	0	737	738	0	0	0
380	0	739	740	0	0	0
381	0	741	742	0	0	0
382	0	743	744	0	0	0
383	0	745	746	0	0	0

A U T O M A T I C L O A D I N G

(FOR ELASTOPLASTIC ANALYSIS)

```
AUTOMETIC SET THE INCREMENTAL LOAD STEP ..(IAUTO)   =  0
     EQ.0   NOT ACTIVATED
     EQ.1   ACTIVATED
AUTOMETIC LOAD ADJUSTMENT . . . . . . . . (IADJ)    =  0
     EQ.0   NOT ACTIVATED
     EQ.1   ACTIVATED
LOAD ADJUSTMENT SEGMENTATION . . . . . . .(NSEG)    =  0
MAXIMUM NO. OF ADJUSTMENT . . . . . . . . (NLIMIT)  =  0
MAXIMUM NO. OF TOTAL TIEE STEP ALLOY . . .(NAXSTE)  =  0
```

L O A D   C O N T R O L   D A T A

```
NUMBER OF NODAL LOADS                              =   21
NUMBER OF LOAD CURVES                              =    1
MAX NO. OF POINTS IN LOAD CURIES                   =   10
GRAVITY LOADING CODE                               =    0
    EQ.0 NO GRAVITY LOADING
    EQ.1 LUMPED GRAVITY LOADING
    EQ.2 CONSISTENT GRAVITY LOADING
MAX PRESSURE LOADING SUBGROUP                      =    0
NO Of PRESSURE LOAD CURVE                          =    0
NO. Of PRESSURE TABLE                              =    0
PRESSURE-GEOMETRY-DEPENDENT FLAG                   =    0
    EQ.0 NO
    EQ.1 YES
NO. OF UNLOADING STEP                              =    0
```

D I S P .   B O U N D A R Y   C O N D I T I O N S

```
NUMBER OF DISP. JOUDARY CONDITIONS                 -    0
```

I N I T I A L   C O N D I T I O N S

```
INITIAL CONDITIONS CODE                          (ICON) =     0
    EQ.0, ZERO INITIAL CONDITIONS
    EQ.1, INITIAL CONDITIONS ARE READ
          (BUT RESTART OVER-RIDES ICON)
```

```
E L E M E N T   G R O U P   D A T A

E L E M E N T   G R O U P ......................... =    1    ( NONLINEAR )

E L E M E N T   D E F I N I T I O N

ELEMENT TYPE . . . . . . . . . . . . . . .( NPAR(1) ). . =    2
    EQ.1, TRUSS ELEMENTS
    EQ.2, 2-DIM ELEMENTS
    EQ.3, 3-DIM ELEMENTS

NUMBER OF ELEMENTS. . . . . . . . . . . .( NPAR(2) ). . =  112

TYPE OF NONLINEAR ANALYSIS . . . . . . .( NPAR(3) ). . =    1
    EQ.1, MATERIAL NONLINEARITY ONLY
    EQ.2, LAGRANGIAN FORMULATION
    EQ.3, EULERIAN FORMULATION

ELEMENT SUBTYPE . . . . . . . . . . . . .( NPAR(5) ). . =    2
    EQ.0, AXISYMMETRIC ELEMENTS
    EQ.1, PLAEE STRAIN ELEMENTS
    EQ.2, PLANE STRESS ELEMENTS

MAX NUMBER OF NODES DESCRIBING
    ANY ONE ELEMENT . . . . . . . . . . .( NPAR(7) ). . =    8

NUMBER OF INTEGRATION POINTS FOR
    ELEMENT STIFFNESS GENERATION. . . . .( NPAR(10)). . =    2

NUMBER OF STRESS OUTPUT TABLES . . . . .( NPAR(13)). . =    0
    EQ.0, PRINT IT INTEGRATION POINTS

J-INTEGRAL ANALYSIS . . . . . . . . . . .( NPAR(14)). . =    1
    EQ.0, NO
    EQ.1, YES WITH NO CRACK EXTENSION
    EQ.2, YES WITH CRACK EXTENSION

M A T E R I A L   D E F I N I T I O N

MATERIAL MODEL. . . . . . . . . . . . . .( NPAR(15)). . =    3
    EQ.1, ISOTROPIC
    EQ.2, ORTHOTROPIC
    EQ.3, ELASTOPLASTIC ( VON MISES )
          ISOTEOPIC PERFACTLY AND BILINEAR HARDENING
    EQ.4, ELASTOPLASTIC ( VON MISES )
          KINEMATIC BILEAR HARDENING
    EQ.5, ELASTOPLASTIC ( YON RISES )
          ISOTROPIC NONLINEAR HARDENING
    EQ.6, CONCRETE PLASTICITY (LEHIGH MODEL)
    EQ.7, ELASTOPLASTIC (DRUCKER-PRAGER)
    EQ.8, THERMO-ELASTIC-CREEP MODEL
    EQ.9, LINEAR VISCOELSTIC

NUMBER OF DIFFERENT SETS OF MATERIAL
    CONSTANTS . . . . . . . . . . . . . .( NPAR(16)). . =    1

NUMBER OF MATERIAL CONSTANTS PER SET. . .( NPAR(17)). . =    4

DIMENSION OF STORAGE ARRAY (WA)
    PER INTEGRATION POINT . . . . . . . .( NPAR(18)). . .   11
```

(B.2)

48	8	1	1	1	0.	1.	175	177	145	143	176	158	144	157
49	8	1	1	1	0.	1.	177	179	147	145	178	159	146	158
50	8	1	1	1	0.	1.	179	181	149	147	180	160	148	159
51	8	1	1	1	0.	1.	193	195	163	161	194	183	162	182
52	8	1	1	1	0.	1.	195	197	165	163	196	184	164	183
53	8	1	1	1	0.	1.	197	199	167	165	198	185	166	184
54	8	1	1	1	0.	1.	199	201	169	167	200	186	168	185
55	8	1	1	1	0.	1.	201	203	171	169	202	187	170	186
56	8	1	1	1	0.	1.	203	205	173	171	204	188	172	187
57	8	1	1	1	0.	1.	205	207	175	173	206	189	174	188
58	8	1	1	1	0.	1.	207	209	177	175	208	190	176	189
59	8	1	1	1	0.	1.	209	211	179	177	210	191	178	190
60	8	1	1	1	0.	1.	211	213	181	179	212	192	180	191
61	8	1	1	1	0.	1.	225	227	195	193	226	215	194	214
62	8	1	1	1	0.	1.	227	229	197	195	228	216	196	215
63	8	1	1	1	0.	1.	229	231	199	197	230	217	198	216
64	8	1	1	1	0.	1.	231	233	201	199	232	218	200	217
65	8	1	1	1	0.	1.	233	235	203	201	234	219	202	218
66	8	1	1	1	0.	1.	235	237	205	203	236	220	204	219
67	8	1	1	1	0.	1.	237	239	207	205	238	221	206	220
68	8	1	1	1	0.	1.	239	241	209	207	240	222	208	221
69	8	1	1	1	0.	1.	241	243	211	209	242	223	210	222
70	8	1	1	1	0.	1.	243	245	213	211	244	224	212	223
71	8	1	1	1	0.	1.	257	259	227	225	258	247	226	246
72	8	1	1	1	0.	1.	259	261	229	227	260	248	228	247
73	8	1	1	1	0.	1.	261	263	231	229	262	249	230	248
74	8	1	1	1	0.	1.	263	265	233	231	264	250	232	249
75	8	1	1	1	0.	1.	265	267	235	233	266	251	234	250
76	8	1	1	1	0.	1.	267	269	237	235	268	252	236	251
77	8	1	1	1	0.	1.	269	271	239	237	270	253	238	252
78	8	1	1	1	0.	1.	271	273	241	239	272	254	240	253
79	8	1	1	1	0.	1.	273	275	243	241	274	255	242	254
80	8	1	1	1	0.	1.	275	277	245	243	276	256	244	255
81	8	1	1	1	0.	1.	289	291	259	257	290	279	258	278
82	8	1	1	1	0.	1.	291	293	261	259	292	280	260	279
83	8	1	1	1	0.	1.	293	295	263	261	294	281	262	280
84	8	1	1	1	0.	1.	295	297	265	263	296	282	264	281
85	8	1	1	1	0.	1.	297	299	267	265	298	283	266	282
86	8	1	1	1	0.	1.	299	301	269	267	300	284	268	283
87	8	1	1	1	0.	1.	301	303	271	269	302	285	270	284
88	8	1	1	1	0.	1.	303	305	273	271	304	286	272	285
89	8	1	1	1	0.	1.	305	307	275	273	306	287	274	286
90	8	1	1	1	0.	1.	307	309	277	275	308	288	276	287
91	8	1	1	1	0.	1.	321	323	291	289	322	311	290	310
92	8	1	1	1	0.	1.	323	325	293	291	324	312	292	311
93	8	1	1	1	0.	1.	325	327	295	293	326	313	294	312
94	8	1	1	1	0.	1.	327	329	297	295	328	314	296	313
95	8	1	1	1	0.	1.	329	331	299	297	330	315	298	314
96	8	1	1	1	0.	1.	331	333	301	299	332	316	300	315
97	8	1	1	1	0.	1.	333	335	303	301	334	317	302	316
98	8	1	1	1	0.	1.	335	337	305	303	336	318	304	317
99	8	1	1	1	0.	1.	337	339	307	305	338	319	306	318
100	8	1	1	1	0.	1.	339	341	309	307	340	320	308	319
101	8	1	1	1	0.	1.	355	357	323	321	356	343	322	342
102	8	1	1	1	0.	1.	357	359	325	323	358	344	324	343
103	8	1	1	1	0.	1.	359	361	327	325	360	345	326	344
104	8	1	1	1	0.	1.	361	363	329	327	362	346	328	345
105	8	1	1	1	0.	1.	363	365	367	329	364	366	347	346
106	8	1	1	1	0.	1.	367	369	331	329	368	348	330	347
107	8	1	1	1	0.	1.	369	371	333	331	370	349	332	348
108	8	1	1	1	0.	1.	373	375	333	371	374	350	349	372
109	8	1	1	1	0.	1.	375	377	335	333	376	351	334	350
110	8	1	1	1	0.	1.	377	379	337	335	378	352	336	351
111	8	1	1	1	0.	1.	379	381	339	337	380	353	338	352
112	8	1	1	1	0.	1.	381	383	341	339	382	354	340	353

MATERIAL CONSTANTS SET NUMBER 1

DEN ....(DENSITY).. = 0.0

E ....(PROP(1)).. = 0.813570D+03
VNU ....(PROP(2)).. = 0.330000D+00
YIELD ....(PROP(3)).. = 0.834622D+03
E (HARDEN) ...(PROP(4)).. = 0.0

ELEMENT INFORMATION

M	ILL	IPS	MTYP	KG	BET	THIC	NODE1	NODE2	NODE3	NODE4	NODE5	NODE6	NODE7	NODE8
1	8	1	1	1	0.	1.	33	35	3	1	34	23	2	22
2	8	1	1	1	0.	1.	35	37	5	3	36	24	4	23
3	8	1	1	1	0.	1.	37	39	7	5	38	25	6	24
4	8	1	1	1	0.	1.	39	41	9	7	40	26	8	25
5	8	1	1	1	0.	1.	41	43	11	9	42	27	10	26
6	8	1	1	1	0.	1.	43	45	13	11	44	28	12	27
7	8	1	1	1	0.	1.	45	47	15	13	46	29	14	28
8	8	1	1	1	0.	1.	47	49	17	15	48	30	16	29
9	8	1	1	1	0.	1.	49	51	19	17	50	31	18	30
10	8	1	1	1	0.	1.	51	53	21	19	52	32	20	31
11	8	1	1	1	0.	1.	65	67	35	33	66	55	34	54
12	8	1	1	1	0.	1.	67	69	37	35	68	56	36	55
13	8	1	1	1	0.	1.	69	71	39	37	70	57	38	56
14	8	1	1	1	0.	1.	71	73	41	39	72	58	40	57
15	8	1	1	1	0.	1.	73	75	43	41	74	59	42	58
16	8	1	1	1	0.	1.	75	77	45	43	75	60	44	59
17	8	1	1	1	0.	1.	77	79	47	45	78	61	46	60
18	8	1	1	1	0.	1.	79	81	49	47	80	62	48	61
19	8	1	1	1	0.	1.	81	83	51	49	82	63	50	62
20	8	1	1	1	0.	1.	83	85	53	51	84	64	52	63
21	8	1	1	1	0.	1.	97	99	67	65	98	87	66	86
22	8	1	1	1	0.	1.	99	101	69	67	100	88	68	87
23	8	1	1	1	0.	1.	101	103	71	69	102	89	70	88
24	8	1	1	1	0.	1.	103	105	73	71	104	90	72	89
25	8	1	1	1	0.	1.	105	107	75	73	106	91	74	90
26	8	1	1	1	0.	1.	107	109	77	75	108	92	76	91
27	8	1	1	1	0.	1.	109	111	79	77	110	93	78	92
28	8	1	1	1	0.	1.	111	113	81	79	112	94	80	93
29	8	1	1	1	0.	1.	113	115	83	81	114	95	82	94
30	8	1	1	1	0.	1.	115	117	85	83	116	96	84	95
31	8	1	1	1	0.	1.	129	131	99	97	130	119	98	118
32	8	1	1	1	0.	1.	131	133	101	99	132	120	100	119
33	8	1	1	1	0.	1.	133	135	103	101	134	121	102	120
34	8	1	1	1	0.	1.	135	137	105	103	136	122	104	121
35	8	1	1	1	0.	1.	137	139	107	105	138	123	106	122
36	8	1	1	1	0.	1.	139	141	109	107	140	124	108	123
37	8	1	1	1	0.	1	141	143	111	109	142	125	110	124
38	8	1	1	1	0.	1	143	145	113	111	144	126	112	125
39	8	1	1	1	0.	1	145	147	115	113	146	127	114	126
40	8	1	1	1	0.	1	147	149	117	115	148	128	116	127
41	8	1	1	1	0.	1	161	163	131	129	162	151	130	150
42	8	1	1	1	0.	1	163	165	133	131	164	152	132	151
43	8	1	1	1	0.	1	165	167	135	133	166	153	134	152
44	8	1	1	1	0.	1	167	169	137	135	168	154	136	153
45	8	1	1	1	0.	1	169	171	139	137	170	155	138	154
46	8	1	1	1	0.	1	171	173	141	139	172	156	140	155
47	8	1	1	1	0.	1	173	175	143	141	174	157	142	156

(B.2)

J - I N T E G R A L   I N F O R M A T I O N,

```
TOTAL NUMBER OF INTEGRAL PATHS  =    8

   TOTAL NUMBER OF NODES AT CRACK TIP =   9
   NODE NUMBERS =  365  366  367  368  369  370  371  372  373

INTEGRATION PATHS FOB J-INTEGRAL AROUND CRACK TIP
AT NODE POINTS 365 366 367 368 369 370 371 372 373

ELEMENTS IN PATH NO    1
1 0 3 1 0 0 1 3 7 1    0    0    0    0    0    0    0    0    0    0    0    0    3    0    5    0    0    0    0    0
ELEMENTS IN PATH NO    2
 94   95   96   97  104  109    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0    0
ELEMENTS IN PATH NO    3
 83   84   85   86   87   98   33   93  103  110    0    0    0    0    0    0    0    0    0    0    0    0    0    0
ELEMENTS IN PATH NO    4
 72   73   74   75   76   77   78   79   88   89   92   99  102  111    0    0    0    0    0    0    0    0    0    0
ELEMENTS IN PATH NO    5
 61   62   63   64   65   66   57   68   69   70   71   80   81   90   31  100  101  112    0    0    0    0    0    0
ELEMENTS IN PATH NO    6
 51   52   53   54   55   56   57   58   59   60   61   70   71   80   81   90   91  100  101  112    0    0    0    0
ELEMENTS IN PATH NO    7
 41   42   43   44   45   46   47   48   49   50   51   60   61   70   71   80   31   90   91  100  101  112    0    0
ELEMENTS IN PATH NO    8
 31   32   33   34   35   36   37   33   39   40   41   50   51   60   61   70   71   80   81   90   91  100  101  112
```

TOTAL SYSTEM DATA

NUMBER OF EQUATIONS	(NEQ)	=	746
NUMBER OF MATRIX ELEMENTS	(NWK)	=	40674
MAXIMUM HALF BANDWIDTH	(MA)	=	71
MEAN HALF BANDWIDTH	(MAM)	=	54
MAXIMUM BLOCK LENGTH	(NEQBLK)	=	12436
NUMBER OF BLOCKS	(NBLK)	=	10

L O A D   D A T A

LOAD FUNCTION NUMBER = 1
NUMBER OF TIME POINTS = 5

TIME VALUE	FUNCTION
0.0	0.0
1.00000	0.3500D-01
4.00000	0.5000D+00
7.00000	0.8000D+00
10.00000	0.9000D+00

CONCENTRATED LOADS

NODE	DIRECTION	LOAD CURVE	LOAD CURVE MULTIPL
1	3	1	0.3615D+03
2	3	1	0.1446D+04
3	3	1	0.7230D+03
4	3	1	0.1446D+04
5	3	1	0.7230D+03
6	3	1	0.1446D+04
7	3	1	0.7230D+03
8	3	1	0.1446D+04
9	3	1	0.7230D+03
10	3	1	0.1446D+04
11	3	1	0.7230D+03
12	3	1	0.1446D+04
13	3	1	0.7230D+03
14	3	1	0.1446D+04
15	3	1	0.7230D+03
16	3	1	0.1446D+04
17	3	1	0.7230D+03
18	3	1	0.1446D+04
19	3	1	0.7230D+03
20	3	1	0.1446D+04
21	3	1	0.3615D+03

(B.2)

I N I T I A L   C O N D I T I O N S

CURRENT STIFFNESS RATIO =   1.00000

E Q U I L I B R I U M   I T E R A T I O N S

TIME STEP =   1   INCREMENTAL NORM =   0.31697D+05   50.61000

ITERATION	UNBALANCED EUCLID NORM	UNBALANCED MAX. NORM
1	0.57735D-19	-0.00000

(B.2)

P E I NT O U T F O R T I M E S T E P 2   (AT TIME 0.2000D+01)

STIFFNESS REFORGED INITIALLY FOR THIS TIME STEP
12 EQUILIBRIUM ITERATIONS PERFORMED ON THIS TIME STEP TO REESTABLISH EQUILIBRIUM

D I S P L A C E M E N T S

NODE	X-DISPLACEMENT	I-DISPLACEYEST	Z-DISPLACEMENT	X-ROTATION	Y-ROTAITON	Z-ROTATION
1	0.0	0.0	0.123339D-01	0.0	0.0	0.0
2	0.0	-0.642714D-03	0.279455D-01	0.0	0.0	0.0
3	0.0	-0.128521D-02	0.435575D-01	0.0	0.0	0.0
4	0.0	-0.192742D-02	0.591702D-01	0.0	0.0	0.0
5	0.0	-0.256864D-02	0.747836D-01	0.0	0.0	0.0
6	0.0	-0.320786D-02	0.903970D-01	0.0	0.0	0.0
7	0.0	-0.384591D-02	0.106010D+00	0.0	0.0	0.0
8	0.0	-0.448229D-02	0.121621D+00	0.0	0.0	0.0
9	0.0	-0.511775D-02	0.137231D+00	0.0	0.0	0.0
10	0.0	-0.575223D-02	0.152838D+00	0.0	0.0	0.0
11	0.0	-0.638637D-02	0.168444D+00	0.0	0.0	0.0
12	0.0	-0.702051D-02	0.184046D+00	0.0	0.0	0.0
13	0.0	-0.765499D-02	0.199647D+00	0.0	0.0	0.0
14	0.0	-0.829047D-02	0.215245D+00	0.0	0.0	0.0
15	0.0	-0.892687D-02	0.230841D+00	0.0	0.0	0.0
16	0.0	-0.956492D-02	0.246436D+00	0.0	0.0	0.0
17	0.0	-0.102041D-01	0.262031D+00	0.0	0.0	0.0
18	0.0	-0.108458D-01	0.277625D+00	0.0	0.0	0.0
19	0.0	-0.114885D-01	0.293221D+00	0.0	0.0	0.0
20	0.0	-0.121311D-01	0.308817D+00	0.0	0.0	0.0
21	0.0	0.340197D-01	0.318569D+00	0.0	0.0	0.0
22	0.0	0.468310D-01	0.648839D-02	0.0	0.0	0.0
23	0.0	0.455445D-01	0.377115D-01	0.0	0.0	0.0
24	0.0	0.442612D-01	0.689408D-01	0.0	0.0	0.0
25	0.0	0.429806D-01	0.100170D+00	0.0	0.0	0.0
26	0.0	0.417024D-01	0.131393D+00	0.0	0.0	0.0
27	0.0	0.404255D-01	0.162607D+00	0.0	0.0	0.0
28	0.0	0.391485D-01	0.193809D+00	0.0	0.0	0.0
29	0.0	0.378702D-01	0.225001D+00	0.0	0.0	0.0
30	0.0	0.365896D-01	0.256188D+00	0.0	0.0	0.0
31	0.0	0.353067D-01	0.287374D+00	0.0	0.0	0.0
32	0.0	0.340195D-01	0.318569D+00	0.0	0.0	0.0
33	0.0	0.936572D-01	0.632016D-03	0.0	0.0	0.0
34	0.0	0.930126D-01	0.162439D-01	0.0	0.0	0.0
35	0.0	0.923685D-01	0.318597D-01	0.0	0.0	0.0
36	0.0	0.917248D-01	0.474775D-01	0.0	0.0	0.0
37	0.0	0.910819D-01	0.630962D-01	0.0	0.0	0.0
38	0.0	0.904401D-01	0.787143D-01	0.0	0.0	0.0
39	0.0	0.897989D-01	0.943314D-01	0.0	0.0	0.0
40	0.0	0.891582D-01	0.109946D+00	0.0	0.0	0.0
41	0.0	0.885177D-01	0.125558D+00	0.0	0.0	0.0
42	0.0	0.878775D-01	0.141167D+00	0.0	0.0	0.0
43	0.0	0.872373D-01	0.156773D+00	0.0	0.0	0.0
44	0.0	0.865972D-01	0.172375D+00	0.0	0.0	0.0
45	0.0	0.859569D-01	0.187974D+00	0.0	0.0	0.0
46	0.0	0.853164D-01	0.203569D+00	0.0	0.0	0.0

D I S P L A C E M E N T S

NODE	X-DISPLACEMENT	Y-DISPLACEMENT	Z-DISPLACEMENT	X-ROTATION	Y-ROTAITON	Z-ROTATION
47	0.0	0.846756D-01	0.219163D+00	0.0	0.0	0.0
48	0.0	0.840344D-01	0.234754D+00	0.0	0.0	0.0
49	0.0	0.833926D-01	0.250343D+00	0.0	0.0	0.0
50	0.0	0.827494D-01	0.265933D+00	0.0	0.0	0.0
51	0.0	0.821055D-01	0.281523D+00	0.0	0.0	0.0
52	0.0	0.814613D-01	0.297116D+00	0.0	0.0	0.0
53	0.0	0.808173D-01	0.312711D+00	0.0	0.0	0.0
54	0.0	0.140495D+00	-0.524669D-02	0.0	0.0	0.0
55	0.0	0.139201D+00	0.259978D-01	0.0	0.0	0.0
56	0.0	0.137912D+00	0.572501D-01	0.0	0.0	0.0
57	0.0	0.136625D+00	0.884963D-01	0.0	0.0	0.0
58	0.0	0.135338D+00	0.119729D+00	0.0	0.0	0.0
59	0.0	0.134049D+00	0.150945D+00	0.0	0.0	0.0
60	0.0	0.132761D+00	0.182144D+00	0.0	0.0	0.0
61	0.0	0.131473D+00	0.213327D+00	0.0	0.0	0.0
62	0.0	0.130186D+00	0.244497D+00	0.0	0.0	0.0
63	0.0	0.128897D+00	0.275661D+00	0.0	0.0	0.0
64	0.0	0.127603D+00	0.306833D+00	0.0	0.0	0.0
65	0.0	0.187372D+00	-0.111503D-01	0.0	0.0	0.0
66	0.0	0.186723D+00	0.448757D-02	0.0	0.0	0.0
67	0.0	0.186076D+00	0.201305D-01	0.0	0.0	0.0
68	0.0	0.185429D+00	0.357689D-01	0.0	0.0	0.0
69	0.0	0.184783D+00	0.514058D-01	0.0	0.0	0.0
70	0.0	0.184134D+00	0.670362D-01	0.0	0.0	0.0
71	0.0	0.183484D+00	0.826617D-01	0.0	0.0	0.0
72	0.0	0.182831D+00	0.982819D-01	0.0	0.0	0.0
73	0.0	0.182176D+00	0.113896D+00	0.0	0.0	0.0
74	0.0	0.181519D+00	0.129507D+00	0.0	0.0	0.0
75	0.0	0.180861D+00	0.145112D+00	0.0	0.0	0.0
76	0.0	0.180204D+00	0.160714D+00	0.0	0.0	0.0
77	0.0	0.179547D+00	0.176311D+00	0.0	0.0	0.0
78	0.0	0.178892D+00	0.191904D+00	0.0	0.0	0.0
79	0.0	0.178238D+00	0.207492D+00	0.0	0.0	0.0
80	0.0	0.177589D+00	0.223074D+00	0.0	0.0	0.0
81	0.0	0.176939D+00	0.238652D+00	0.0	0.0	0.0
82	0.0	0.176293D+00	0.254224D+00	0.0	0.0	0.0
83	0.0	0.175645D+00	0.269794D+00	0.0	0.0	0.0
84	0.0	0.174999D+00	0.285360D+00	0.0	0.0	0.0
85	0.0	0.174350D+00	0.300931D+00	0.0	0.0	0.0
86	0.0	0.234338D+00	-0.170838D-01	0.0	0.0	0.0
87	0.0	0.233039D+00	0.142611D-01	0.0	0.0	0.0
88	0.0	0.231737D+00	0.455640D-01	0.0	0.0	0.0
89	0.0	0.230409D+00	0.768196D-01	0.0	0.0	0.0
90	0.0	0.229051D+00	0.108043D+00	0.0	0.0	0.0
91	0.0	0.227674D+00	0.139253D+00	0.0	0.0	0.0
92	0.0	0.226296D+00	0.170456D+00	0.0	0.0	0.0
93	0.0	0.224938D+00	0.201647D+00	0.0	0.0	0.0
94	0.0	0.223610D+00	0.232808D+00	0.0	0.0	0.0
95	0.0	0.222308D+00	0.263926D+00	0.0	0.0	0.0
96	0.0	0.221009D+00	0.295001D+00	0.0	0.0	0.0
97	0.0	0.231469D+00	-0.229953D-01	0.0	0.0	0.0
98	0.0	0.280825D+00	-0.726584D-02	0.0	0.0	0.0

D I S P L A C E M E N T S

NODE	X-DISPLACEMENT	Y-DISPLACEMENT	Z-DISPLACEMENT	X-ROTATION	I-ROTAITON	Z-ROTATION
99	0.0	0.280182D+00	0.843794D-02	0.0	0.0	0.0
100	0.0	0.279529D+00	0.241006D-01	0.0	0.0	0.0
101	0.0	0.278864D+00	0.397356D-01	0.0	0.0	0.0
102	0.0	0.278176D+00	0.553433D-01	0.0	0.0	0.0
103	0.0	0.277470D+00	0.709341D-01	0.0	0.0	0.0
104	0.0	0.276742D+00	0.865181D-01	0.0	0.0	0.0
105	0.0	0.275993D+00	0.102099D+00	0.0	0.0	0.0
106	0.0	0.275242D+00	0.117689D+00	0.0	0.0	0.0
107	0.0	0.274480D+00	0.133285D+00	0.0	0.0	0.0
108	0.0	0.273720D+00	0.148896D+00	0.0	0.0	0.0
109	0.0	0.272966D+00	0.164513D+00	0.0	0.0	0.0
110	0.0	0.272227D+00	0.180138D+00	0.0	0.0	0.0
111	0.0	0.271502D+00	0.195761D+00	0.0	0.0	0.0
112	0.0	0.270800D+00	0.211377D+00	0.0	0.0	0.0
113	3.0	0.270116D+00	0.226977D+00	0.0	0.0	0.0
114	0.0	0.269451D+00	0.242553D+00	0.0	0.0	0.0
115	0.0	0.268799D+00	0.258102D+00	0.0	0.0	0.0
116	0.0	0.268156D+00	0.273613D+00	0.0	0.0	0.0
117	0.0	0.267513D+00	0.289098D+00	0.0	0.0	0.0
118	0.0	0.313033D+00	-0.268942D-01	0.0	0.0	0.0
119	0.0	0.311765D+00	0.460779D-02	0.0	0.0	0.0
120	0.0	0.310429D+00	0.358601D-01	0.0	0.0	0.0
121	0.0	0.308959D+00	0.669599D-01	0.0	0.0	0.0
122	0.3	0.307355D+00	0.980376D-01	0.0	0.0	0.0
123	0.0	0.305677D+00	0.129193D+00	0.0	0.0	0.0
124	0.0	0.304011D+00	0.160458D+00	0.0	0.0	0.0
125	0.0	0.302431D+00	0.191792D+00	0.0	0.0	0.0
126	3.0	0.300980D+00	0.223101D+00	0.0	0.0	0.0
127	0.0	0.299653D+00	0.254270D+00	0.0	0.0	0.0
128	0.0	0.298387D+00	0.285211D+00	0.0	0.0	0.0
129	0.0	0.344752D+00	-0.306669D-01	0.0	0.0	0.0
130	0.0	0.344145D+00	-0.148333D-01	0.0	0.0	0.0
131	0.3	0.343529D+00	0.383303D-03	0.0	0.0	0.0
132	0.0	0.342872D+00	0.164823D-01	0.0	0.0	0.0
133	0.0	0.342169D+00	0.319989D-01	0.0	0.0	0.0
134	0.0	0.341400D+00	0.474599D-01	0.0	0.0	0.0
135	0.0	0.340575D+00	0.628958D-01	0.0	0.0	0.0
136	0.0	0.339692D+00	0.783419D-01	0.0	0.0	0.0
137	0.0	0.338768D+00	0.938142D-01	0.0	0.0	0.0
138	0.0	0.337816D+00	0.109341D+00	0.0	0.0	0.0
139	0.0	0.336854D+00	0.124921D+00	0.0	0.0	0.0
140	0.0	0.335899D+00	0.140567D+00	0.0	0.0	0.0
141	0.0	0.334967D+00	0.156261D+00	0.0	0.0	0.0
142	0.0	0.334074D+00	0.172000D+00	0.0	0.0	0.0
143	0.0	0.333226D+00	0.187758D+00	0.0	0.0	0.0
144	0.0	0.332433D+00	0.203516D+00	0.0	0.0	0.0
145	0.0	0.331692D+00	0.219248D+00	0.0	0.0	0.0
146	0.0	0.331004D+00	0.234928D+00	0.0	0.0	0.0
147	0.0	0.330357D+00	0.250536D+00	0.0	0.0	0.0
148	0.0	0.329740D+00	0.266043D+00	0.0	0.0	0.0
149	0.0	0.329132D+00	0.281444D+00	0.0	0.0	0.0
150	0.0	0.368662D+00	-0.333664D-01	0.0	0.0	0.0

D I S P L A C E M E N T S

NODE	X-DISPLACEMENT	Y-DISPLACEMENT	Z-DISPLACEMENT	X-ROTATION	Y-ROTAITON	Z-ROTATION
151	0.0	0.367491D+00	-0.181049D-02	0.0	0.0	0.0
152	0.0	0.366107D+00	0.291127D-01	0.0	0.0	0.0
153	0.0	0.364384D+00	0.597593D-01	0.0	0.0	0.0
154	0.0	0.362366D+00	0.904938D-01	0.0	0.0	0.0
155	0.0	0.360212D+00	0.121553D+00	0.0	0.0	0.0
156	0.0	0.358111D+00	0.152986D+00	0.0	0.0	0.0
157	0.0	0.356219D+00	0.184674D+00	0.0	0.0	0.0
158	0.0	0.354612D+00	0.216382D+00	0.0	0.0	0.0
159	0.0	0.353277D+00	0.247827D+00	0.0	0.0	0.0
160	0.0	0.352104D+00	0.278743D+00	0.0	0.0	0.0
161	0.0	0.392678D+00	-0.358501D-01	0.0	0.0	0.0
162	0.0	0.392155D+00	-0.199677D-01	0.0	0.0	0.0
163	0.0	0.391594D+00	-0.435779D-02	0.0	0.0	0.0
164	0.0	0.390940D+00	0.110149D-01	0.0	0.0	0.0
165	0.0	0.390179D+00	0.262320D-01	0.0	0.0	0.0
166	0.0	0.389286D+00	0.413701D-01	0.0	0.0	0.0
167	0.0	0.388280D+00	0.564942D-01	0.0	0.0	0.0
168	0.0	0.387169D+00	0.716826D-01	0.0	0.0	0.0
169	0.0	0.385985D+00	0.869665D-01	0.0	0.0	0.0
170	0.0	0.384761D+00	0.102398D+00	0.0	0.0	0.0
171	0.0	0.383527D+00	0.117972D+00	0.0	0.0	0.0
172	0.0	0.382323D+00	0.133702D+00	0.0	0.0	0.0
173	0.0	0.381170D+00	0.149557D+00	0.0	0.0	0.0
174	0.0	0.380096D+00	0.165513D+00	0.0	0.0	0.0
175	0.0	0.379110D+00	0.181528D+00	0.0	0.0	0.0
176	0.0	0.378223D+00	0.197556D+00	0.0	0.0	0.0
177	0.0	0.377433D+00	0.213551D+00	0.0	0.0	0.0
178	0.0	0.376733D+00	0.229462D+00	0.0	0.0	0.0
179	0.0	0.376111D+00	0.245242D+00	0.0	0.0	0.0
180	0.0	0.375547D+00	0.260842D+00	0.0	0.0	0.0
181	0.0	0.375011D+00	0.276224D+00	0.0	0.0	0.0
182	0.0	0.416792D+00	-0.380372D-01	0.0	0.0	0.0
183	0.0	0.415830D+00	-0.671558D-02	0.0	0.0	0.0
184	0.0	0.414375D+00	0.233549D-01	0.0	0.0	0.0
185	0.0	0.412251D+00	0.530592D-01	0.0	0.0	0.0
186	0.0	0.409605D+00	0.831737D-01	0.0	0.0	0.0
187	0.0	0.406780D+00	0.114127D+00	0.0	0.0	0.0
188	0.0	0.404130D+00	0.145940D+00	0.0	0.0	0.0
189	0.0	0.401898D+00	0.178311D+00	0.0	0.0	0.0
190	0.0	0.400167D+00	0.210773D+00	0.0	0.0	0.0
191	0.0	0.398833D+00	0.242821D+00	0.0	0.0	0.0
192	0.0	0.397889D+00	0.273951D+00	0.0	0.0	0.0
193	0.0	0.440951D+00	-0.397309D-01	0.0	0.0	0.0
194	0.0	0.440614D+00	-0.239776D-01	0.0	0.0	0.0
195	0.0	0.440172D+00	-0.878710D-02	0.0	0.0	0.0
196	0.0	0.439532D+00	0.596431D-02	0.0	0.0	0.0
197	0.0	0.438673D+00	0.204608D-01	0.0	0.0	0.0
198	0.0	0.437571D+00	0.348794D-01	0.0	0.0	0.0
199	0.0	0.436258D+00	0.493536D-01	0.0	0.0	0.0
200	0.0	0.434774D+00	0.640386D-01	0.0	0.0	0.0
201	0.0	0.433178D+00	0.789889D-01	0.0	0.0	0.0
202	0.0	0.431539D+00	0.942928D-01	0.0	0.0	0.0

D I S P L A C E M E N T S

YODE	I-DISPLACEFEN1	Y-DISPLACEMENT	Z-DISPLACEMENT	I-ROTATIOH	I-ROTAITON	Z-ROTATION
203	0.0	0.429920D+00	0.109923D+00	0.0	0.0	0.0
204	0.0	0.428386D+00	0.125884D+00	0.0	0.0	0.0
205	0.0	0.426967D+00	0.142099D+00	0.0	0.0	0.0
206	0.0	0.425705D+00	0.158513D+00	0.0	0.0	0.0
207	0.0	0.424598D+00	0.175035D+00	0.0	0.0	0.0
208	0.0	0.423656D+00	0.191586D+00	0.0	0.0	0.0
209	0.0	0.422863D+00	0.208087D+00	0.0	0.0	0.0
210	0.0	0.422204D+00	0.224456D+00	0.0	0.0	0.0
211	0.0	0.421659D+00	0.240619D+00	0.0	0.0	0.0
212	0.0	0.421201D+00	0.256502D+00	0.0	0.0	0.0
213	0.0	0.420801D+00	0.272018D+00	0.0	0.0	0.0
214	0.0	0.465055D+00	-0.407592D-01	0.0	0.0	0.0
215	0.0	0.464540D+00	-0.104947D-01	0.0	0.0	0.0
216	0.0	0.462997D+00	0.175388D-01	0.0	0.0	0.0
217	0.0	0.460235D+00	0.453004D-01	0.0	0.0	0.0
218	0.0	0.456640D+00	0.743188D-01	0.0	0.0	0.0
219	0.0	0.452908D+00	0.105292D+00	0.0	0.0	0.0
220	0.0	0.449671D+00	0.138017D+00	0.0	0.0	0.0
221	0.0	0.447244D+00	0.171725D+00	0.0	0.0	0.0
222	0.0	0.445595D+00	0.205535D+00	0.0	0.0	0.0
223	0.0	0.444533D+00	0.238697D+00	0.0	0.0	0.0
224	0.0	0.443858D+00	0.270524D+00	0.0	0.0	0.0
225	0.0	0.488898D+00	-0.407650D-01	0.0	0.0	0.0
226	0.0	0.488943D+00	-0.256939D-01	0.0	0.0	0.0
227	0.0	0.488740D+00	-0.116926D-01	0.0	0.0	0.0
228	0.0	0.488169D+00	0.160050D-02	0.0	0.0	0.0
229	0.0	0.487190D+00	0.145403D-01	0.0	0.0	0.0
230	0.0	0.485794D+00	0.274983D-01	0.0	0.0	0.0
231	0.0	0.484053D+00	0.407195D-01	0.0	0.0	0.0
232	0.0	0.482037D+00	0.545198D-01	0.0	0.0	0.0
233	0.0	0.479882D+00	0.689513D-01	0.0	0.0	0.0
234	0.0	0.477719D+00	0.841911D-01	0.0	0.0	0.0
235	0.0	0.475647D+00	0.100112D+00	0.0	0.0	0.0
236	0.0	0.473815D+00	0.116674D+00	0.0	0.0	0.0
237	0.0	0.472239D+00	0.133708D+00	0.0	0.0	0.0
238	0.0	0.470945D+00	0.151007D+00	0.0	0.0	0.0
239	0.0	0.469926D+00	0.168473D+00	0.0	0.0	0.0
240	0.0	0.469124D+00	0.185891D+00	0.0	0.0	0.0
241	0.0	0.468518D+00	0.203207D+00	0.0	0.0	0.0
242	0.0	0.468039D+00	0.220301D+00	0.0	0.0	0.0
243	0.0	0.467681D+00	0.237107D+00	0.0	0.0	0.0
244	0.0	0.467406D+00	0.253562D+00	0.0	0.0	0.0
245	0.0	0.467214D+00	0.269534D+00	0.0	0.0	0.0
246	0.0	0.512104D+00	-0.393905D-01	0.0	0.0	0.0
247	0.0	0.512471D+00	-0.122422D-01	0.0	0.0	0.0
248	0.0	0.510996D+00	0.114610D-01	0.0	0.0	0.0
249	0.0	0.507527D+00	0.355065D-01	0.0	0.0	0.0
250	0.0	0.502768D+00	0.627650D-01	0.0	0.0	0.0
251	0.0	0.498107D+00	0.943203D-01	0.0	0.0	0.0
252	0.0	0.494686D+00	0.129191D+00	0.0	0.0	0.0
253	0.0	0.492756D+00	0.165360D+00	0.0	0.0	0.0
254	0.0	0.491805D+00	0.201195D+00	0.0	0.0	0.0

D I S P L A C E M E N T S

NODE	X-DISPLACEMENT	Y-DISPLACEMENT	Z-DISPLACEMENT	X-ROTATION	Y-ROTATION	Z-ROTATION
255	0.0	0.491312D+00	0.235922D+00	0.0	0.0	0.0
256	0.0	0.491081D+00	0.269132D+00	0.0	0.0	0.0
257	0.0	0.534029D+00	-0.361701D-01	0.0	0.0	0.0
258	0.0	0.534779D+00	-0.232304D-01	0.0	0.0	0.0
259	0.0	0.535056D+00	-0.119698D-01	0.0	0.0	0.0
260	0.0	0.534789D+00	-0.165531D-02	0.0	0.0	0.0
261	0.0	0.533912D+00	0.829966D-02	0.0	0.0	0.0
262	0.0	0.532424D+00	0.184688D-01	0.0	0.0	0.0
263	0.0	0.530377D+00	0.294056D-01	0.0	0.0	0.0
264	0.0	0.527883D+00	0.416122D-01	0.0	0.0	0.0
265	0.0	0.525190D+00	0.553565D-01	0.0	0.0	0.0
266	0.0	0.522519D+00	0.708637D-01	0.0	0.0	0.0
267	0.0	0.520191D+00	0.878038D-01	0.0	0.0	0.0
268	0.0	0.518424D+00	0.105931D+00	0.0	0.0	0.0
269	0.0	0.517176D+00	0.124714D+00	0.0	0.0	0.0
270	0.0	0.516435D+00	0.143750D+00	0.0	0.0	0.0
271	0.0	0.516032D+00	0.162683D+00	0.0	0.0	0.0
272	0.0	0.515848D+00	0.181343D+00	0.0	0.0	0.0
273	0.0	0.515788D+00	0.199655D+00	0.0	0.0	0.0
274	0.0	0.515734D+00	0.217577D+00	0.0	0.0	0.0
275	0.0	0.515691D+00	0.235132D+00	0.0	0.0	0.0
276	0.0	0.515655D+00	0.252360D+00	0.0	0.0	0.0
277	0.0	0.515681D+00	0.269215D+00	0.0	0.0	0.0
278	0.0	0.547456D+00	-0.327307D-01	0.0	0.0	0.0
279	0.0	0.549059D+00	-0.112180D-01	0.0	0.0	0.0
280	0.0	0.548357D+00	0.618693D-02	0.0	0.0	0.0
281	0.0	0.545101D+00	0.247842D-01	0.0	0.0	0.0
282	0.0	0.539767D+00	0.496410D-01	0.0	0.0	0.0
283	0.0	0.534798D+00	0.830893D-01	0.0	0.0	0.0
284	0.0	0.532303D+00	0.121931D+00	0.0	0.0	0.0
285	0.0	0.532009D+00	0.161276D+00	0.0	0.0	0.0
286	0.0	0.532294D+00	0.198937D+00	0.0	0.0	0.0
287	0.0	0.532477D+00	0.234841D+00	0.0	0.0	0.0
288	0.0	0.532570D+00	0.269511D+00	0.0	0.0	0.0
289	0.0	0.559485D+00	-0.282125D-01	0.0	0.0	0.0
290	0.0	0.560875D+00	-0.181838D-01	0.0	0.0	0.0
291	0.0	0.561685D+00	-0.997192D-02	0.0	0.0	0.0
292	0.0	0.562004D+00	-0.271423D-02	0.0	0.0	0.0
293	0.0	0.561723D+00	0.419982D-02	0.0	0.0	0.0
294	0.0	0.560821D+00	0.114381D-01	0.0	0.0	0.0
295	0.0	0.559194D+00	0.197322D-01	0.0	0.0	0.0
296	0.0	0.556931D+00	0.301101D-01	0.0	0.0	0.0
297	0.0	0.554234D+00	0.430082D-01	0.0	0.0	0.0
298	0.0	0.551435D+00	0.593036D-01	0.0	0.0	0.0
299	0.0	0.549158D+00	0.780079D-01	0.0	0.0	0.0
300	0.0	0.548060D+00	0.982244D-01	0.0	0.0	0.0
301	0.0	0.547982D+00	0.119574D+00	0.0	0.0	0.0
302	0.0	0.548086D+00	0.140118D+00	0.0	0.0	0.0
303	0.0	0.548529D+00	0.160274D+00	0.0	0.0	0.0
304	0.0	0.548998D+00	0.179683D+00	0.0	0.0	0.0
305	0.0	0.549357D+00	0.198485D+00	0.0	0.0	0.0
306	0.0	0.549591D+00	0.216778D+00	0.0	0.0	0.0

D I S P L A C E M E N T S

NODE	X-DISPLACEMENT	Y-DISPLACEMENT	Z-DISPLACEMENT	X-ROTATION	I-ROTAITON	Z-ROTATION
307	0.0	0.549722D+00	0.234692D+00	0.0	0.0	0.0
308	0.0	0.549801D+00	0.252343D+00	0.0	0.0	0.0
309	0.0	0.549389D+00	0.269885D+00	0.0	0.0	0.0
310	0.0	0.569623D+00	-0.224582D-01	0.0	0.0	0.0
311	0.0	0.572492D+00	-0.814779D-02	0.0	0.0	0.0
312	0.0	0.573527D+00	0.246590D-02	0.0	0.0	0.0
313	0.0	0.572671D+00	0.144330D-01	0.0	0.0	0.0
314	0.0	0.568280D+00	0.357159D-01	0.0	0.0	0.0
315	0.0	0.563331D+00	0.723135D-01	0.0	0.0	0.0
316	0.0	0.564017D+00	0.117294D+00	0.0	0.0	0.0
317	0.0	0.565961D+00	0.159762D+00	0.0	0.0	0.0
318	0.0	0.567031D+00	0.198272D+00	0.0	0.0	0.0
319	0.0	0.567433D+00	0.234646D+00	0.0	0.0	0.0
320	0.0	0.567592D+00	0.270235D+00	0.0	0.0	0.0
321	0.0	0.577366D+00	-0.157207D-01	0.0	0.0	0.0
322	0.0	0.579373D+00	-0.101290D-01	0.0	0.0	0.0
323	0.0	0.580815D+00	-0.583613D-02	0.0	0.0	0.0
324	0.0	0.581964D+00	-0.217835D-02	0.0	0.0	0.0
325	0.0	0.583038D+00	0.117500D-02	0.0	0.0	0.0
326	0.0	0.583940D+00	0.468787D-02	0.0	0.0	0.0
327	0.0	0.584349D+00	0.930267D-02	0.0	0.0	0.0
328	0.0	0.584347D+00	0.152811D-01	0.0	0.0	0.0
329	0.0	0.583362D+00	0.268991D-01	0.0	0.0	0.0
330	0.0	0.580388D+00	0.441311D-01	0.0	0.0	0.0
331	0.0	0.578202D+00	0.662796D-01	0.0	0.0	0.0
332	0.0	0.579778D+00	0.925803D-01	0.0	0.0	0.0
333	0.0	0.582045D+00	0.116306D+00	0.0	0.0	0.0
334	0.0	0.583535D+00	0.138879D+00	0.0	0.0	0.0
335	0.0	0.584452D+00	0.159533D+00	0.0	0.0	0.0
336	0.0	0.584980D+00	0.179288D+00	0.0	0.0	0.0
337	0.0	0.585243D+00	0.198211D+00	0.0	0.0	0.0
338	0.0	0.585426D+00	0.216607D+00	0.0	0.0	0.0
339	0.0	0.585483D+00	0.234653D+00	0.0	0.0	0.0
340	0.0	0.585526D+00	0.252548D+00	0.0	0.0	0.0
341	0.0	0.585580D+00	0.270509D+00	0.0	0.0	0.0
342	0.0	0.582247D+00	-0.806282D-02	0.0	0.0	0.0
343	0.0	0.586088D+00	-0.304219D-02	0.0	0.0	0.0
344	0.0	0.589280D+00	0.493249D-03	0.0	0.0	0.0
345	0.0	0.593315D+00	0.393957D-02	0.0	0.0	0.0
346	0.0	0.598201D+00	0.160192D-01	0.0	0.0	0.0
347	0.0	0.608635D+00	0.305332D-01	0.0	0.0	0.0
348	0.0	0.611186D+00	0.539302D-01	0.0	0.0	0.0
349	0.0	0.611798D+00	0.744313D-01	0.0	0.0	0.0
350	0.0	0.603158D+00	0.116381D+00	0.0	0.0	0.0
351	0.0	0.603939D+00	0.159591D+00	0.0	0.0	0.0
352	0.0	0.603961D+00	0.198192D+00	0.0	0.0	0.0
353	0.0	0.603706D+00	0.243629D+00	0.0	0.0	0.0
354	0.0	0.598235D+00	0.270602D+00	0.0	0.0	0.0
355	0.0	0.583898D+00	0.0	0.0	0.0	0.0
356	0.0	0.586180D+00	0.0	0.0	0.0	0.0
357	0.0	0.587967D+00	0.0	0.0	0.0	0.0
358	0.0	0.589596D+00	0.0	0.0	0.0	0.0

NODE	X-DISPLACEMENT	Y-DISPLACEMENT	Z-DISPLACEMENT	X-ROTATION	Y-ROTAITON	Z-ROTATION
359	0.0	0.591452D+00	0.0	0.0	0.0	0.0
360	0.0	0.593859D+00	0.0	0.0	0.0	0.0
361	0.0	0.597246D+00	0.0	0.0	0.0	0.0
362	0.0	0.600747D+00	0.0	0.0	0.0	0.0
363	0.0	0.604963D+00	0.0	0.0	0.0	0.0
364	0.0	0.615083D+00	0.0	0.0	0.0	0.0
365	0.0	0.647806D+00	0.0	0.0	0.0	0.0
366	0.0	0.642245D+00	0.0	0.0	0.0	0.0
367	0.0	0.638120D+00	0.0	0.0	0.0	0.0
368	0.0	0.635099D+00	0.0	0.0	0.0	0.0
369	0.0	0.631364D+00	0.0	0.0	0.0	0.0
370	0.0	0.630050D+00	0.0	0.0	0.0	0.0
371	0.0	0.628185D+00	0.0	0.0	0.0	0.0
372	0.0	0.633494D+00	0.0	0.0	0.0	0.0
373	0.0	0.642800D+00	0.0	0.0	0.0	0.0
374	0.0	0.626150D+00	0.745149D-01	0.0	0.0	0.0
375	0.0	0.625341D+00	0.116540D+00	0.0	0.0	0.0
376	0.0	0.624834D+00	0.138658D+00	0.0	0.0	0.0
377	0.0	0.624102D+00	0.159480D+00	0.0	0.0	0.0
378	0.0	0.623317D+00	0.179178D+00	0.0	0.0	0.0
379	0.0	0.622609D+00	0.198097D+00	0.0	0.0	0.0
380	0.0	0.622042D+00	0.225566D+00	0.0	0.0	0.0
381	0.0	0.621774D+00	0.252600D+00	0.0	0.0	0.0
382	0.0	0.615571D+00	0.261600D+00	0.0	0.0	0.0
383	0.0	0.611364D+00	0.270649D+00	0.0	0.0	0.0

S T R E S S   C A L C U L A T I O N S   F O R   E L E M E N T   G R O U P   1   (2/D CONTINUUM)
(PLANE STRESS)

ELEMENT NUM/IPT	STRESS STATE	STRESS-YY	STRESS-ZZ	STRESS-YZ	STRAIN-YY	STRAIN-ZZ	STRAIN-YZ	EFFECTIVE STRESS	EFFECTIVE STRAIN
1									
1	ELASTIC	0.0	158.5	0.1	-0.643D-03	0.195D-02	0.193D-05	158.5	0.176D-02
2	ELASTIC	0.0	158.8	0.2	-0.644D-03	0.195D-02	0.638D-05	158.7	0.176D-02
3	ELASTIC	0.0	158.5	0.0	-0.643D-03	0.195D-02	0.420D-06	158.5	0.176D-02
4	ELASTIC	0.0	158.8	0.1	-0.644D-03	0.195D-02	0.231D-05	158.8	0.176D-02
2									
1	ELASTIC	0.2	158.5	0.1	-0.641D-03	0.195D-02	0.374D-05	158.4	0.175D-02
2	ELASTIC	0.1	158.6	0.3	-0.642D-03	0.195D-02	0.100D-04	158.5	0.176D-02
3	ELASTIC	0.1	158.5	0.1	-0.642D-03	0.195D-02	0.296D-05	158.5	0.176D-02
4	ELASTIC	0.1	158.7	0.3	-0.643D-03	0.195D-02	0.833D-05	158.7	0.176D-02
3									
1	ELASTIC	0.3	158.5	0.1	-0.639D-03	0.195D-02	0.383D-05	158.3	0.175D-02
2	ELASTIC	0.2	158.4	0.3	-0.641D-03	0.195D-02	0.949D-05	158.3	0.175D-02
3	ELASTIC	0.2	158.5	0.1	-0.640D-03	0.195D-02	0.399D-05	158.4	0.175D-02
4	ELASTIC	0.1	158.5	0.3	-0.641D-03	0.195D-02	0.102D-04	158.4	0.175D-02
4									
1	ELASTIC	0.5	158.5	0.1	-0.637D-03	0.195D-02	0.253D-05	158.2	0.175D-02
2	ELASTIC	0.2	158.3	0.2	-0.640D-03	0.195D-02	0.605D-05	158.2	0.175D-02
3	ELASTIC	0.4	158.5	0.1	-0.638D-03	0.195D-02	0.343D-05	158.3	0.175D-02
4	ELASTIC	0.2	158.4	0.3	-0.640D-03	0.195D-02	0.819D-05	158.3	0.175D-02
5									
1	ELASTIC	0.5	158.5	0.0	-0.636D-03	0.195D-02	0.458D-06	158.2	0.175D-02
2	ELASTIC	0.2	158.3	0.0	-0.640D-03	0.194D-02	0.112D-05	158.2	0.175D-02
3	ELASTIC	0.5	158.5	0.1	-0.637D-03	0.195D-02	0.173D-05	158.2	0.175D-02
4	ELASTIC	0.2	158.3	0.1	-0.640D-03	0.194D-02	0.395D-05	158.2	0.175D-02
6									
1	ELASTIC	0.5	158.5	-0.1	-0.637D-03	0.195D-02	-0.174D-05	158.2	0.175D-02
2	ELASTIC	0.2	158.3	-0.1	-0.640D-03	0.194D-02	-0.404D-05	158.2	0.175D-02
3	ELASTIC	0.5	158.5	-0.0	-0.636D-03	0.195D-02	-0.475D-06	158.2	0.175D-02
4	ELASTIC	0.2	158.3	-0.0	-0.640D-03	0.194D-02	-0.122D-05	158.2	0.175D-02
7									
1	ELASTIC	0.4	158.5	-0.1	-0.638D-03	0.195D-02	-0.343D-05	158.3	0.175D-02
2	ELASTIC	0.2	158.4	-0.3	-0.640D-03	0.195D-02	-0.822D-05	158.3	0.175D-02
3	ELASTIC	0.5	158.5	-0.1	-0.637D-03	0.195D-02	-0.254D-05	158.2	0.175D-02
4	ELASTIC	0.2	158.3	-0.2	-0.640D-03	0.195D-02	-0.612D-05	158.2	0.175D-02
8									
1	ELASTIC	0.2	158.5	-0.1	-0.640D-03	0.195D-02	-0.403D-05	158.4	0.175D-02
2	ELASTIC	0.1	158.5	-0.3	-0.641D-03	0.195D-02	-0.101D-04	158.4	0.175D-02
3	ELASTIC	0.3	158.5	-0.1	-0.639D-03	0.195D-02	-0.384D-05	158.3	0.175D-02
4	ELASTIC	0.2	158.4	-0.3	-0.641D-03	0.195D-02	-0.946D-05	158.3	0.175D-02
9									
1	ELASTIC	0.1	158.5	-0.1	-0.642D-03	0.195D-02	-0.314D-05	158.5	0.176D-02
2	ELASTIC	0.1	158.7	-0.2	-0.643D-03	0.195D-02	-0.805D-05	158.6	0.176D-02
3	ELASTIC	0.2	158.5	-0.1	-0.641D-03	0.195D-02	-0.382D-05	158.4	0.175D-02
4	ELASTIC	0.1	158.6	-0.3	-0.642D-03	0.195D-02	-0.997D-05	158.5	0.176D-02
10									
1	ELASTIC	0.0	158.5	-0.0	-0.643D-03	0.195D-02	-0.372D-06	158.5	0.176D-02
2	ELASTIC	-0.0	158.8	-0.1	-0.644D-03	0.195D-02	-0.173D-05	158.8	0.176D-02
3	ELASTIC	0.0	158.6	-0.0	-0.643D-03	0.195D-02	-0.150D-05	158.5	0.176D-02
4	ELASTIC	0.1	158.7	-0.2	-0.643D-03	0.195D-02	-0.609D-05	158.7	0.176D-02

1	ELASTIC	0.0	159.1	0.3	-0.645D-03	0.195D-02	0.863D-05	159.1	0.176D-02
2	ELASTIC	-0.0	159.3	0.2	-0.646D-03	0.196D-02	0.806D-05	159.4	0.176D-02
3	ELASTIC	-0.0	159.3	0.1	-0.646D-03	0.196D-02	0.283D-05	159.3	0.176D-02
4	ELASTIC	-0.0	159.9	0.1	-0.649D-03	0.197D-02	0.233D-05	159.9	0.177D-02
12									
1	ELASTIC	0.0	158.6	0.4	-0.643D-03	0.195D-02	0.122D-04	158.6	0.176D-02
2	ZLASTIC	-0.1	158.6	0.2	-0.645D-03	0.195D-02	0.693D-05	158.6	0.176D-02
3	ELASTIC	0.0	158.9	0.3	-0.644D-03	0.195D-02	0.114D-04	158.9	0.176D-02
4	ELASTIC	-0.1	158.9	0.2	-0.646D-03	0.195D-02	0.708D-05	159.0	0.176D-02
13									
1	ELASTIC	0.0	158.3	0.3	-0.642D-03	0.195D-02	0.107D-04	158.3	0.175D-02
2	ELASTIC	-0.4	158.1	0.1	-0.647D-03	0.195D-02	0.229D-05	158.3	0.175D-02
3	ELASTIC	0.1	158.5	0.4	-0.642D-03	0.195D-02	0.122D-04	158.5	0.175D-02
4	ELASTIC	-0.3	158.3	0.1	-0.646D-03	0.195D-02	0.453D-05	158.5	0.175D-02
14									
1	ELASTIC	0.0	158.1	0.2	-0.641D-03	0.194D-02	0.638D-05	158.1	0.175D-02
2	ELASTIC	-0.7	158.0	-0.0	-0.649D-03	0.194D-02	-0.686D-06	158.3	0.175D-02
3	ELASTIC	0.1	158.2	0.3	-0.641D-03	0.194D-02	0.904D-05	158.2	0.175D-02
4	ELASTIC	-0.6	158.0	0.0	-0.648D-03	0.194D-02	0.101D-05	158.3	0.175D-02
15									
1	ELASTIC	0.0	158.0	0.0	-0.641D-03	0.194D-02	0.108D-05	158.0	0.175D-02
2	ELASTIC	-0.8	157.9	-0.0	-0.651D-03	0.194D-02	-0.937D-06	158.3	0.175D-02
3	ELASTIC	0.0	158.1	0.1	-0.641D-03	0.194D-02	0.407D-05	158.0	0.175D-02
4	ELASTIC	-0.8	157.9	-0.0	-0.650D-03	0.194D-02	-0.204D-06	158.3	0.175D-02
16									
1	ELASTIC	0.0	158.1	-0.1	-0.641D-03	0.194D-02	-0.432D-05	158.1	0.175D-02
2	ELASTIC	-0.8	157.9	-0.0	-0.651D-03	0.194D-02	-0.310D-06	158.3	0.175D-02
3	ELASTIC	0.0	158.0	-0.0	-0.641D-03	0.194D-02	-0.139D-05	158.0	0.175D-02
4	ELASTIC	-0.8	157.9	0.0	-0.651D-03	0.194D-02	0.327D-06	158.3	0.175D-02
17									
1	ELASTIC	0.0	158.2	-0.3	-0.641D-03	0.194D-02	-0.907D-05	158.2	0.175D-02
2	ELASTIC	-0.6	158.0	-0.0	-0.649D-03	0.194D-02	-0.123D-05	158.3	0.175D-02
3	ELASTIC	0.0	158.1	-0.2	-0.641D-03	0.194D-02	-0.656D-05	158.1	0.175D-02
4	ELASTIC	-0.7	158.0	0.0	-0.649D-03	0.194D-02	0.238D-06	158.3	0.175D-02
18									
1	SLASTIC	0.1	158.5	-0.4	-0.642D-03	0.195D-02	-0.120D-04	158.5	0.176D-02
2	ELASTIC	-0.3	158.3	-0.1	-0.646D-03	0.195D-02	-0.436D-05	158.5	0.176D-02
3	ELASTIC	0.0	158.3	-0.3	-0.642D-03	0.195D-02	-0.106D-04	158.3	0.175D-02
4	ELASTIC	-0.4	158.2	-0.1	-0.647D-03	0.195D-02	-0.231D-05	158.4	0.175D-02
19									
1	ELASTIC	0.0	158.9	-0.3	-0.644D-03	0.195D-02	-0.112D-04	158.9	0.176D-02
2	ELASTIC	-0.1	158.9	-0.2	-0.646D-03	0.195D-02	-0.663D-05	159.0	0.176D-02
3	SLASTIC	0.0	158.6	-0.4	-0.643D-03	0.195D-02	-0.119D-04	158.6	0.176D-02
4	ELASTIC	-0.2	158.6	-0.2	-0.645D-03	0.195D-02	-0.649D-05	158.7	0.176D-02
20									
1	LASTIC	0.0	159.3	-0.1	-0.646D-03	0.196D-02	-0.339D-05	159.3	0.176D-02
2	ELASTIC	-0.0	159.9	-0.1	-0.649D-03	0.197D-02	-0.216D-05	159.9	0.177D-02
3	ELASTIC	-0.0	159.0	-0.2	-0.645D-03	0.195D-02	-0.804D-05	159.1	0.176D-02
4	ELASTIC	-0.0	159.3	-0.2	-0.647D-03	0.196D-02	-0.747D-05	159.3	0.176D-02
21									
1	ELASTIC	-0.1	159.4	0.0	-0.648D-03	0.196D-02	0.159D-05	159.5	0.177D-02
2	ELASTIC	-0.4	158.1	-1.0	-0.646D-03	0.194D-02	-0.328D-04	158.3	0.175D-02
3	ELASTIC	0.0	160.5	0.1	-0.651D-03	0.197D-02	0.238D-05	160.5	0.178D-02
4	ELASTIC	-0.0	159.6	-0.2	-0.648D-03	0.196D-02	-0.794D-05	159.6	0.177D-02
22									

(B.2)

	1	ELASTIC	-0.6	158.3	-0.2	=0.649D-03	0.195D-02	-0.665D-05	158.6	0.176D-02
	2	ELASTIC	-1.9	157.3	-2.3	-0.661D-03	0.194D-02	-0.762D-04	158.2	0.175D-02
	3	ELASTIC	-0.2	158.9	-0.0	-0.647D-03	0.195D-02	-0.194D-06	159.0	0.176D-02
	4	ELASTIC	-0.9	157.4	-1.7	-0.650D-03	0.194D-02	-0.540D-04	157.9	0.175D-02
23										
	1	ELASTIC	-1.2	157.9	-0.4	-0.656D-03	0.195D-02	-0.138D-04	158.5	0.176D-02
	2	ELASTIC	-3.9	158.0	-2.7	-0.689D-03	0.196D-02	-0.899D-04	160.1	0.177D-02
	3	ELASTIC	-0.8	158.1	-0.3	-0.651D-03	0.195D-02	-0.103D-04	158.5	0.176D-02
	4	ELASTIC	-2.8	157.4	-2.6	-0.672D-03	0.195D-02	-0.865D-04	158.9	0.176D-02
24										
	1	ELASTIC	-1.8	157.9	-0.4	-0.663D-03	0.195D-02	-0.123D-04	158.8	0.176D-02
	2	ELASTIC	-5.6	159.2	-2.0	-0.715D-03	0.198D-02	-0.646D-04	162.1	0.179D-02
	3	ELASTIC	-1.4	157.9	-0.5	-0.658D-03	0.195D-02	-0.148D-04	158.6	0.176D-02
	4	ELASTIC	-4.7	158.5	-2.5	-0.701D-03	0.197D-02	-0.830D-04	161.0	0.178D-02
25										
	1	ELASTIC	-2.1	158.0	-0.1	-0.667D-03	0.195D-02	-0.291D-05	159.1	0.176D-02
	2	ELASTIC	-6.4	159.9	-0.4	-0.727D-03	0.199D-02	-0.119D-04	163.2	0.180D-02
	3	ELASTIC	-2.0	153.0	-0.3	-0.665D-03	0.195D-02	-0.989D-05	159.0	0.176D-02
	4	ELASTIC	-6.1	159.6	-1.3	-0.722D-03	0.199D-02	-0.436D-04	162.7	0.180D-02
26										
	1	ELASTIC	-2.0	158.0	0.3	-0.665D-03	0.195D-02	0.834D-05	159.0	0.176D-02
	2	ELASTIC	-6.0	159.6	1.4	-0.721D-03	0.199D-02	0.450D-04	162.7	0.180D-02
	3	ELASTIC	-2.1	153.0	0.0	-0.667D-03	0.195D-02	0.119D-05	159.1	0.176D-02
	4	ELASTIC	-6.4	159.9	0.4	-0.727D-03	0.199D-02	0.139D-04	163.1	0.180D-02
27										
	1	ELASTIC	-1.5	158.0	0.4	-0.659D-03	0.195D-02	0.142D-04	158.7	0.176D-02
	2	ELASTIC	-4.6	158.6	2.5	-0.699D-03	0.197D-02	0.823D-04	160.9	0.178D-02
	3	ELASTIC	-1.8	158.0	0.3	-0.663D-03	0.195D-02	0.112D-04	158.9	0.176D-02
	4	ELASTIC	-5.5	159.2	2.0	-0.713D-03	0.198D-02	0.648D-04	162.1	0.179D-02
28										
	1	ELASTIC	-0.8	158.2	0.3	-0.651D-03	0.195D-02	0.110D-04	158.6	0.176D-02
	2	ELASTIC	-2.6	157.5	2.6	-0.671D-03	0.195D-02	0.850D-04	158.9	0.176D-02
	3	ELASTIC	-1.3	158.0	0.4	-0.656D-03	0.195D-02	0.138D-04	158.6	0.176D-02
	4	FLASTIC	-3.7	158.1	2.7	-0.687D-03	0.196D-02	0.882D-04	160.1	0.177D-02
29										
	1	ELASTIC	-0.2	158.9	0.1	-0.647D-03	0.195D-02	0.171D-05	159.0	0.176D-02
	2	ELASTIC	-0.9	157.5	1.6	-0.650D-03	0.194D-02	0.539D-04	158.0	0.175D-02
	3	ELASTIC	-0.6	158.4	0.2	-0.650D-03	0.195D-02	0.776D-05	158.7	0.176D-02
	4	ELASTIC	-1.8	157.3	2.3	-0.660D-03	0.194D-02	0.751D-04	158.3	0.175D-02
30										
	1	ELASTIC	0.0	160.4	-0.1	-0.650D-03	0.197D-02	-0.173D-05	160.4	0.178D-02
	2	ELASTIC	-0.0	159.4	0.3	-0.647D-03	0.196D-02	0.838D-05	159.4	0.177D-02
	3	ELASTIC	-0.1	159.4	-0.0	-0.648D-03	0.196D-02	-0.611D-06	159.5	0.177D-02
	4	ELASTIC	-0.4	158.0	1.0	-0.646D-03	0.194D-02	0.338D-04	158.2	0.175D-02
31										
	1	ELASTIC	-0.7	155.9	-2.4	-0.641D-03	0.192D-02	-0.771D-04	156.3	0.173D-02
	2	ELASTIC	-1.4	150.5	-5.3	-0.627D-03	0.186D-02	-0.175D-03	151.5	0.168D-02
	3	ELASTIC	-0.0	157.8	-0.6	-0.640D-03	0.194D-02	-0.204D-04	157.8	0.175D-02
	4	ELASTIC	-0.1	152.0	-1.5	-0.618D-03	0.187D-02	-0.487D-04	152.1	0.168D-02
32										
	1	ELASTIC	-3.4	155.9	-4.9	-0.674D-03	0.193D-02	-0.159D-03	157.8	0.175D-02
	2	ELASTIC	-6.2	153.4	-10.1	-0.698D-03	0.191D-02	-0.330D-03	157.5	0.174D-02
	3	ELASTIC	-1.7	155.6	-3.6	-0.651D-03	0.192D-02	-0.113D-03	156.5	0.173D-02
	4	ELASTIC	-3.1	151.0	-7.8	-0.651D-03	0.187D-02	-0.256D-03	153.2	0.169D-02
33										
	1	ELASTIC	-6.8	158.3	-5.4	-0.726D-03	0.197D-02	-0.176D-03	162.1	0.179D-02
	2	ELASTIC	-12.1	159.7	-10.6	-0.797D-03	0.201D-02	-0.346D-03	167.1	0.184D-02

	3	ELASTIC	-4.8	156.8	-5.4	-0.695D-03	0.195D-02	-0.176D-03	159.6	0.176D-02
	4	ELASTIC	-8.7	155.9	-10.9	-0.740D-03	0.195D-02	-0.355D-03	161.5	0.178D-02
34										
	1	ELASTIC	-9.6	161.0	-3.7	-0.771D-03	0.202D-02	-0.121D-03	166.2	0.184D-02
	2	ELASTIC	-16.7	165.6	-6.9	-0.877D-03	0.210D-02	-0.225D-03	174.9	0.193D-02
	3	ELASTIC	-8.2	159.6	-4.9	-0.749D-03	0.199D-02	-0.161D-03	164.0	0.181D-02
	4	ELASTIC	-14.3	162.5	-9.4	-0.835D-03	0.206D-02	-0.308D-03	170.9	0.189D-02
35										
	1	ELASTIC	-10.8	162.4	-0.6	-0.792D-03	0.204D-02	-0.194D-04	168.1	0.186D-02
	2	ELASTIC	-18.4	168.2	-0.7	-0.906D-03	0.214D-02	-0.239D-04	178.1	0.196D-02
	3	ELASTIC	-10.4	161.8	-2.5	-0.784D-03	0.203D-02	-0.815D-04	167.3	0.185D-02
	U	ELASTIC	-17.8	167.2	-4.4	-0.897D-03	0.213D-02	-0.144D-03	176.9	0.195D-02
36										
	1	ELASTIC	-10.1	161.8	2.7	-0.780D-03	0.203D-02	0.881D-04	167.1	0.185D-02
	2	ELASTIC	-16.8	166.6	5.4	-0.882D-03	0.212D-02	0.178D-03	175.8	0.194D-02
	3	ELASTIC	-10.8	162.4	0.9	-0.791D-03	0.204D-02	0.285D-04	168.0	0.186D-02
	4	ELASTIC	-16.1	163.0	2.0	-0.903D-03	0.214D-02	0.666D-04	177.7	0.196D-02
37										
	1	ELASTIC	-7.7	159.5	4.9	-0.741D-03	0.199D-02	0.160D-03	163.7	0.181D-02
	2	ELASTIC	-12.7	161.7	9.5	-0.812D-03	0.204D-02	0.310D-03	169.2	0.187D-02
	3	ELASTIC	-9.2	160.9	3.8	-0.766D-03	0.202D-02	0.125D-03	165.9	0.183D-02
	4	ELASTIC	-15.2	164.8	7.5	-0.856D-03	0.209D-02	0.246D-03	173.4	0.191D-02
38										
	1	ELASTIC	-4.5	156.9	5.2	-0.691D-03	0.195D-02	0.170D-03	159.5	0.176D-02
	2	ELASTIC	-7.4	155.8	10.1	-0.722D-03	0.194D-02	0.332D-03	160.5	0.177D-02
	3	ELASTIC	-6.3	153.3	5.3	-0.720D-03	0.197D-02	0.173D-03	161.9	0.179D-02
	4	ELASTIC	-10.4	159.2	10.2	-0.774D-03	0.200D-02	0.335D-03	165.6	0.183D-02
39										
	1	ELASTIC	-1.6	155.7	3.5	-0.651D-03	0.192D-02	0.115D-03	156.6	0.173D-02
	2	ELASTIC	-2.6	151.5	7.1	-0.646D-03	0.187D-02	0.233D-03	153.3	0.170D-02
	3	ELASTIC	-3.1	156.1	4.7	-0.671D-03	0.193D-02	0.153D-03	157.9	0.175D-02
	4	ELASTIC	-5.2	153.6	9.3	-0.686D-03	0.191D-02	0.304D-03	157.0	0.174D-02
43										
	1	ELASTIC	-0.0	157.5	0.6	-0.639D-03	0.194D-02	0.208D-04	157.5	0.174D-02
	2	ELASTIC	-0.1	152.0	1.4	-0.618D-03	0.187D-02	0.455D-04	152.1	0.168D-02
	3	ELASTIC	-0.7	155.9	2.3	-0.641D-03	0.192D-02	0.761 D-OU	156.3	0.173D-02
	4	ELASTIC	-1.2	151.0	4.9	-0.626D-03	0.186D-02	0.161 D-03	151.8	0.168D-02
41										
	1	ELASTIC	-2.0	144.8	-8.3	-0.612D-03	0.179D-02	-0.270D-03	146.5	0.162D-02
	2	ELASTIC	-3.0	134.4	-13.5	-0.581D-03	0.166D-02	-0.441D-03	137.9	0.152D-02
	3	ELASTIC	-0.2	145.7	-2.4	-0.593D-03	0.179D-02	-0.778D-04	145.9	0.162D-02
	U	ELASTIC	-0.3	133.1	-4.0	-0.544D-03	0.164D-02	-0.130D-03	133.4	0.148D-02
42										
	1	ELASTIC	-8.8	150.9	-15.1	-0.720D-03	0.189D-02	-0.493D-03	157.7	0.174D-02
	2	ELASTIC	-12.9	147.4	-23.6	-0.756D-03	0.186D-02	-0.772D-03	159.5	0.176D-02
	3	ELASTIC	-4.5	146.7	-11.9	-0.650D-03	0.182D-02	-0.389D-03	150.4	0.166D-02
	4	ELASTIC	-6.8	138.6	-19.1	-0.646D-03	0.173D-02	-0.623D-03	145.9	0.161D-02
43										
	1	ELASTIC	-16.8	161.4	-15.3	-0.862D-03	0.205D-02	-0.502D-03	172.5	0.190D-02
	2	ELASTIC	-24.3	165.2	-23.1	-0.969D-03	0.213D-02	-0.756D-03	183.0	0.201D-02
	3	ELASTIC	-12.3	155.4	-16.0	-0.781D-03	0.196D-02	-0.524D-03	164.2	0.181D-02
	4	ELASTIC	-18.0	154.9	-24.6	-0.850D-03	0.198D-02	-0.805D-03	170.1	0.187D-02
44										
	1	ELASTIC	-22.9	170.3	-9.6	-0.972D-03	0.219D-02	-0.315D-03	183.5	0.202D-02
	2	ELASTIC	-32.3	179.1	-13.7	-0.112D-02	0.233D-02	-0.447D-03	198.6	0.218D-02
	3	ELASTIC	-19.8	165.7	-13.5	-0.916D-03	0.212D-02	-0.441D-03	178.0	0.196D-02
	4	ELASTIC	-28.4	172.0	-19.9	-0.105D-02	0.223D-02	-0.649D-03	190.9	0.210D-02

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	1	ELASTIC	-24.8	173.9	-0.7	-0.101D-02	0.224D-02	-0.223D-04	187.5	0.206D-02
	2	ELASTIC	-34.2	184.0	0.0	-0.117D-02	0.240D-02	0.107D-05	203.3	0.223D-02
	3	ELASTIC	-24.3	172.6	-6.0	-0.998D-03	0.222D-02	-0.196D-03	186.2	0.205D-02
46	4	ELASTIC	-33.8	182.5	-8.0	-0.116D-02	0.238D-02	-0.260D-03	202.0	0.222D-02
	1	ELASTIC	-22.4	171.3	8.1	-0.970D-03	0.220D-02	0.264D-03	184.0	0.203D-02
	2	ELASTIC	-30.0	179.2	12.8	-0.110D-02	0.232D-02	0.418D-03	197.2	0.217D-02
	3	ELASTIC	-24.3	173.5	3.3	-0.100D-02	0.223D-02	0.107D-03	186.9	0.206D-02
47	4	ELASTIC	-32.9	183.1	5.9	-0.115D-02	0.238D-02	0.193D-03	201.9	0.222D-02
	1	ELASTIC	-16.7	163.9	13.7	-0.870D-03	0.208D-02	0.449D-03	174.5	0.192D-02
	2	ELASTIC	-21.9	167.4	20.6	-0.948D-03	0.215D-02	0.675D-03	182.8	0.201D-02
	3	ELASTIC	-20.3	168.5	11.0	-0.933D-03	0.215D-02	0.360D-03	180.5	0.199D-02
48	4	ELASTIC	-26.9	174.8	16.9	-0.104D-02	0.226D-02	0.552D-03	191.9	0.211D-02
	1	ELASTIC	-9.7	154.8	14.6	-0.747D-03	0.194D-02	0.479D-03	161.8	0.179D-02
	2	ELASTIC	-12.5	152.9	21.6	-0.774D-03	0.193D-02	0.707D-03	163.8	0.181D-02
	3	ELASTIC	-13.7	160.0	14.8	-0.816D-03	0.202D-02	0.482D-03	169.2	0.187D-02
49	4	ELASTIC	-17.9	161.2	21.9	-0.874D-03	0.205D-02	0.716D-03	175.1	0.193D-02
	1	ELASTIC	-3.5	147.5	10.5	-0.641D-03	0.183D-02	0.342D-03	150.4	0.166D-02
	2	ELASTIC	-4.4	140.6	15.5	-0.625D-03	0.175D-02	0.508D-03	145.3	0.161D-02
	3	ELASTIC	-6.8	151.1	13.5	-0.696D-03	0.189D-02	0.440D-03	156.4	0.173D-02
50	4	ELASTIC	-8.8	147.1	19.9	-0.704D-03	0.184D-02	0.649D-03	155.5	0.172D-02
	1	ELASTIC	-0.1	146.2	2.1	-0.595D-03	0.180D-02	0.692D-04	146.3	0.162D-02
	2	ELASTIC	-0.2	135.6	3.2	-0.552D-03	0.167D-02	0.106D-03	135.8	0.150D-02
	3	ELASTIC	-1.5	145.9	7.3	-0.611D-03	0.180D-02	0.238D-03	147.2	0.163D-02
51	4	ELASTIC	-2.0	137.2	11.0	-0.581D-03	0.169D-02	0.359D-03	139.5	0.154D-02
	1	ELASTIC	-4.1	123.3	-18.7	-0.550D-03	0.153D-02	-0.613D-03	129.6	0.143D-02
	2	ELASTIC	-5.7	102.1	-28.7	-0.484D-03	0.126D-02	-0.940D-03	116.3	0.128D-02
	3	ELASTIC	-0.3	119.7	-5.6	-0.490D-03	0.147D-02	-0.182D-03	120.3	0.133D-02
52	4	ELASTIC	-0.7	91.5	-8.8	-0.379D-03	0.113D-02	-0.288D-03	93.1	0.103D-02
	1	ELASTIC	-17.0	143.8	-31.9	-0.792D-03	0.184D-02	-0.104D-02	162.7	0.179D-02
	2	ELASTIC	-23.6	138.7	-47.1	-0.853D-03	0.180D-02	-0.154D-02	172.4	0.189D-02
	3	ELASTIC	-8.8	131.0	-26.1	-0.640D-03	0.165D-02	-0.853D-03	142.9	0.158D-02
53	4	ELASTIC	-12.8	115.7	-39.4	-0.627D-03	0.147D-02	-0.129D-02	140.3	0.154D-02
	1	ELASTIC	-31.3	169.3	-30.3	-0.107D-02	0.221D-02	-0.991D-03	194.2	0.213D-02
	2	ELASTIC	-42.7	179.1	-42.9	-0.125D-02	0.237D-02	-0.140D-02	217.0	0.238D-02
	3	ELASTIC	-23.3	155.1	-33.0	-0.915D-03	0.200D-02	-0.108D-02	177.4	0.195D-02
54	4	ELASTIC	-32.4	156.5	-47.8	-0.103D-02	0.206D-02	-0.156D-02	193.6	0.212D-02
	1	ELASTIC	-40.7	183.2	-17.1	-0.126D-02	0.248D-02	-0.558D-03	213.5	0.235D-02
	2	ELASTIC	-54.0	206.7	-22.0	-0.150D-02	0.276D-02	-0.721D-03	241.4	0.265D-02
	3	ELASTIC	-36.1	178.8	-25.8	-0.117D-02	0.234D-02	-0.842D-03	204.3	0.224D-02
55	4	ELASTIC	-48.8	193.1	-35.3	-0.138D-02	0.257D-02	-0.116D-02	229.9	0.252D-02
	1	ELASTIC	-42.1	194.2	1.2	-0.130D-02	0.256D-02	0.389D-04	218.3	0.240D-02
	2	ELASTIC	-53.8	213.2	4.8	-0.153D-02	0.284D-02	0.156D-03	244.8	0.269D-02
	3	ELASTIC	-42.3	192.4	-9.5	-0.130D-02	0.254D-02	-0.310D-03	217.3	0.239D-02
56	4	ELASTIC	-55.4	212.2	-10.5	-0.154D-02	0.283D-02	-0.345D-03	245.3	0.269D-02

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	1	ELASTIC	-36.1	187.0	17.5	-0.120D-02	0.244D-02	0.573D-03	209.6	0.230D-02
	2	ELASTIC	-44.0	200.2	26.9	-0.135D-02	0.264D-02	0.880D-03	230.2	0.253D-02
	3	ELASTIC	-40.4	192.4	8.7	-0.129D-02	0.253D-02	0.285D-03	216.0	0.237D-02
57	4	ELASTIC	-50.4	209.8	15.3	-0.147D-02	0.278D-02	0.501D-03	240.5	0.264D-02
	1	ELASTIC	-25.8	170.6	27.1	-0.101D-02	0.220D-02	0.886D-03	190.7	0.210D-02
	2	ELASTIC	-29.8	175.2	39.4	-0.108D-02	0.227D-02	0.125D-02	203.0	0.223D-02
	3	ELASTIC	-32.1	180.6	22.6	-0.113D-02	0.235D-02	0.739D-03	202.5	0.223D-02
58	4	ELASTIC	-37.9	190.6	33.3	-0.124D-02	0.250D-02	0.109D-02	219.8	0.241D-02
	1	ELASTIC	-14.5	151.0	28.0	-0.791D-03	0.191D-02	0.914D-03	166.0	0.183D-02
	2	ELASTIC	-15.8	146.9	38.0	-0.790D-03	0.187D-02	0.124D-02	168.7	0.186D-02
	3	ELASTIC	-20.9	162.3	28.6	-0.915D-03	0.208D-02	0.934D-03	180.6	0.199D-02
59	4	ELASTIC	-23.4	163.2	39.7	-0.950D-03	0.210D-02	0.130D-02	189.0	0.208D-02
	1	ELASTIC	-5.2	133.9	20.1	-0.606D-03	0.167D-02	0.657D-03	140.9	0.156D-02
	2	ELASTIC	-5.4	121.7	26.8	-0.560D-03	0.152D-02	0.878D-03	132.9	0.147D-02
	3	ELASTIC	-10.1	143.1	25.7	-0.704D-03	0.180D-02	0.839D-03	154.9	0.171D-02
60	4	ELASTIC	-10.9	135.4	34.5	-0.683D-03	0.171D-02	0.113D-02	153.3	0.169D-02
	1	ELASTIC	-0.2	124.9	4.2	-0.509D-03	0.154D-02	0.139D-03	125.2	0.139D-02
	2	ELASTIC	-0.2	105.2	5.8	-0.429D-03	0.129D-02	0.188D-03	105.7	0.117D-02
	3	ELASTIC	-2.3	128.6	14.3	-0.549D-03	0.159D-02	0.466D-03	132.1	0.146D-02
61	4	ELASTIC	-2.5	113.1	19.2	-0.489D-03	0.140D-02	0.628D-03	119.1	0.132D-02
	1	ELASTIC	-7.4	80.4	-38.6	-0.417D-03	0.102D-02	-0.126D-02	107.6	0.118D-02
	2	ELASTIC	-9.7	40.9	-55.8	-0.286D-03	0.542D-03	-0.183D-02	107.3	0.117D-02
	3	ELASTIC	-0.6	62.6	-11.9	-0.261D-03	0.772D-03	-0.388D-03	66.2	0.732D-03
62	4	ELASTIC	-1.1	5.2	-17.6	-0.342D-04	0.683D-04	-0.574D-03	31.0	0.338D-03
	1	ELASTIC	-29.9	134.0	-61.4	-0.911D-03	0.177D-02	-0.201D-02	184.8	0.202D-02
	2	ELASTIC	-38.1	129.3	-35.7	-0.989D-03	0.173D-02	-0.280D-02	211.8	0.231D-02
	3	ELASTIC	-16.1	102.0	-52.2	-0.611D-03	0.132D-02	-0.171D-02	143.1	0.157D-02
63	4	ELASTIC	-20.6	76.3	-74.0	-0.563D-03	0.102D-02	-0.242D-02	155.8	0.170D-02
	1	ELASTIC	-52.7	189.5	-54.0	-0.142D-02	0.254D-02	-0.176D-02	239.6	0.263D-02
	2	ELASTIC	-65.9	212.3	-72.2	-0.167D-02	0.288D-02	-0.236D-02	281.1	0.308D-02
	3	ELASTIC	-40.3	159.3	-61.5	-0.114D-02	0.212D-02	-0.201D-02	211.6	0.232D-02
64	4	ELASTIC	-51.2	166.5	-84.4	-0.130D-02	0.225D-02	-0.276D-02	245.4	0.268D-02
	1	ELASTIC	-65.0	225.3	-25.4	-0.171D-02	0.303D-02	-0.832D-03	267.5	0.293D-02
	2	ELASTIC	-73.3	262.0	-29.2	-0.204D-02	0.354D-02	-0.956D-03	313.5	0.344D-02
	3	ELASTIC	-59.6	208.2	-43.6	-0.158D-02	0.280D-02	-0.142D-02	254.9	0.279D-02
65	4	ELASTIC	-74.4	238.6	-55.6	-0.188D-02	0.323D-02	-0.182D-02	299.2	0.328D-02
	1	ELASTIC	-62.5	231.8	9.2	-0.171D-02	0.310D-02	0.301D-03	269.0	0.295D-02
	2	ELASTIC	-72.5	264.8	20.5	-0.197D-02	0.355D-02	0.671D-03	309.6	0.340D-02
	3	ELASTIC	-65.8	231.6	-10.5	-0.175D-02	0.311D-02	-0.343D-03	271.1	0.297D-02
66	4	ELASTIC	-78.2	269.2	-6.8	-0.205D-02	0.363D-02	-0.222D-03	315.8	0.346D-02
	1	ELASTIC	-48.6	212.4	36.4	-0.146D-02	0.281D-02	0.119D-02	248.6	0.273D-02
	2	ELASTIC	-49.6	230.5	54.9	-0.154D-02	0.303D-02	0.179D-02	275.8	0.303D-02
	3	ELASTIC	-57.8	225.8	22.3	-0.163D-02	0.301D-02	0.729D-03	262.4	0.288D-02
67	4	ELASTIC	-63.0	254.2	37.9	-0.180D-02	0.338D-02	0.124D-02	298.1	0.327D-02
	1	ELASTIC	-30.8	178.7	48.7	-0.110D-02	0.232D-02	0.159D-02	213.3	0.234D-02
	2	ELASTIC	-25.5	180.6	65.4	-0.105D-02	0.232D-02	0.214D-02	225.2	0.247D-02

	3	ELASTIC	-41.1	198.9	43.6	-0.131D-02	0.261D-02	0.142D-02	234.7	0.258D-02
	4	ELASTIC	-39.4	209.8	61.5	-0.134D-02	0.274D-02	0.201D-02	255.3	0.280D-02
68										
	1	ELASTIC	-15.4	142.3	46.2	-0.767D-03	0.181D-02	0.151D-02	170.6	0.188D-02
	2	ELASTIC	-9.8	132.4	56.9	-0.657D-03	0.167D-02	0.186D-02	169.2	0.186D-02
	3	ELASTIC	-23.5	163.0	49.3	-0.951D-03	0.210D-02	0.161D-02	195.5	0.215D-02
	4	ELASTIC	-18.5	158.8	63.0	-0.872D-03	0.203D-02	0.206D-02	201.1	0.221D-02
69										
	1	ELASTIC	-5.1	110.3	32.1	-0.510D-03	0.133D-02	0.105D-02	125.9	0.139D-02
	2	ELASTIC	-2.4	91.9	37.3	-0.402D-03	0.114D-02	0.122D-02	113.3	0.125D-02
	3	ELASTIC	-10.2	128.1	41.5	-0.645D-03	0.162D-02	0.136D-02	151.6	0.167D-02
	4	ELASTIC	-6.4	113.9	49.6	-0.540D-03	0.143D-02	0.162D-02	145.3	0.160D-02
70										
	1	ELASTIC	-0.2	85.8	6.9	-0.355D-03	0.107D-02	0.227D-03	87.7	0.971D-03
	2	ELASTIC	0.0	57.6	7.9	-0.233D-03	0.708D-03	0.258D-03	59.2	0.655D-03
	3	ELASTIC	-2.2	99.1	22.9	-0.429D-03	0.123D-02	0.748D-03	107.8	0.119D-02
	4	ELASTIC	-1.2	76.4	26.5	-0.324D-03	0.944D-03	0.867D-03	89.6	0.988D-03
71										
	1	ELASTIC	-11.0	3.0	-71.3	-0.147D-03	0.812D-04	-0.233D-02	124.2	0.135D-02
	2	ELASTIC	-10.6	-61.9	-92.9	0.121D-03	-0.718D-03	-0.304D-02	170.8	0.187D-02
	3	ELASTIC	-1.2	-51.6	-22.9	0.194D-03	-0.629D-03	-0.750D-03	64.6	0.712D-03
	4	ELASTIC	-1.0	-153.6	-30.3	0.610D-03	-0.188D-02	-0.989D-03	161.8	0.179D-02
72										
	1	ELASTIC	-43.2	124.2	-107.0	-0.104D-02	0.170D-02	-0.350D-02	238.8	0.261D-02
	2	ELASTIC	-41.2	118.0	-137.5	-0.985D-03	0.162D-02	-0.450D-02	277.9	0.303D-02
	3	ELASTIC	-24.2	53.4	-93.8	-0.514D-03	0.755D-03	-0.307D-02	176.5	0.192D-02
	4	ELASTIC	-22.0	14.6	-120.7	-0.330D-03	0.269D-03	-0.395D-02	211.5	0.231D-02
73										
	1	ELASTIC	-75.5	234.9	-87.3	-0.188D-02	0.319D-02	-0.285D-02	318.6	0.349D-02
	2	ELASTIC	-75.8	279.8	-110.9	-0.207D-02	0.375D-02	-0.363D-02	377.0	0.413D-02
	3	ELASTIC	-58.3	175.7	-104.5	-0.143D-02	0.240D-02	-0.342D-02	278.0	0.304D-02
	4	ELASTIC	-56.4	192.2	-134.8	-0.147D-02	0.259D-02	-0.441D-02	324.7	0.355D-02
74										
	1	ELASTIC	-89.3	298.3	-29.6	-0.231D-02	0.403D-02	-0.967D-03	355.3	0.389D-02
	2	ELASTIC	-91.2	369.8	-28.8	-0.262D-02	0.491D-02	-0.940D-03	425.7	0.467D-02
	3	ELASTIC	-84.2	270.3	-65.7	-0.213D-02	0.366D-02	-0.215D-02	340.4	0.373D-02
	4	ELASTIC	-86.9	329.4	-81.2	-0.240D-02	0.440D-02	-0.265D-02	405.6	0.445D-02
75										
	1	ELASTIC	-75.2	297.2	33.4	-0.213D-02	0.396D-02	0.109D-02	345.9	0.379D-02
	2	ELASTIC	-68.4	351.4	61.7	-0.227D-02	0.460D-02	0.202D-02	404.5	0.444D-02
	3	ELASTIC	-86.3	304.6	-1.3	-0.230D-02	0.409D-02	-0.440D-04	355.7	0.390D-02
	4	ELASTIC	-88.2	374.0	12.8	-0.260D-02	0.495D-02	0.420D-03	425.6	0.467D-02
76										
	1	ELASTIC	-45.2	245.8	72.7	-0.155D-02	0.321D-02	0.238D-02	299.1	0.328D-02
	2	ELASTIC	-24.0	260.5	104.9	-0.135D-02	0.330D-02	0.343D-02	328.1	0.361D-02
	3	ELASTIC	-63.9	277.7	54.1	-0.191D-02	0.367D-02	0.177D-02	328.2	0.360D-02
	U	ELASTIC	-48.4	318.1	88.3	-0.189D-02	0.411D-02	0.289D-02	377.3	0.415D-02
77										
	1	ELASTIC	-17.1	178.3	78.8	-0.933D-03	0.226D-02	0.258D-02	231.9	0.255D-02
	2	ELASTIC	7.4	164.3	95.9	-0.576D-03	0.199D-02	0.314D-02	231.1	0.254D-02
	3	ELASTIC	-31.6	216.6	79.1	-0.127D-02	0.279D-02	0.259D-02	271.1	0.298D-02
	4	ELASTIC	-5.5	217.4	107.1	-0.950D-03	0.269D-02	0.350D-02	288.0	0.317D-02
78										
	1	ELASTIC	-2.4	120.7	63.4	-0.519D-03	0.149D-02	0.207D-02	164.1	0.180D-02
	2	ELASTIC	15.4	97.5	65.5	-0.207D-03	0.114D-02	0.214D-02	145.3	0.160D-02
	3	ELASTIC	-8.7	153.0	74.0	-0.727D-03	0.192D-02	0.242D-02	203.1	0.223D-02
	4	ELASTIC	13.9	132.6	84.6	-0.367D-03	0.157D-02	0.276D-02	193.4	0.213D-02

1	ELASTIC	1.0	75.1	39.0	-0.292D-03	0.919D-03	0.127D-02	100.6	0.111D-02
2	ELASTIC	7.6	51.5	34.7	-0.115D-03	0.603D-03	0.114D-02	77.1	0.848D-03
3	ELASTIC	0.4	101.0	53.7	-0.405D-03	0.124D-02	0.176D-02	137.2	0.151D-02
4	ELASTIC	12.6	76.5	51.8	-0.155D-03	0.889D-03	0.169D-02	114.5	0.126D-02
80									
1	ELASTIC	-0.0	33.7	8.1	-0.137D-03	0.414D-03	0.266D-03	36.5	0.404D-03
2	ELASTIC	0.5	4.7	6.5	-0.128D-04	0.558D-04	0.214D-03	12.2	0.133D-03
3	ELASTIC	0.6	58.2	27.1	-0.228D-03	0.713D-03	0.887D-03	74.6	0.821D-03
4	ELASTIC	3.8	33.4	23.1	-0.888D-04	0.395D-03	0.756D-03	51.0	0.561D-03
81									
1	ELASTIC	-7.2	-107.7	-104.7	0.349D-03	-0.129D-02	-0.342D-02	209.3	0.229D-02
2	ELASTIC	-1.1	-163.8	-110.0	0.651D-03	-0.201D-02	-0.360D-02	250.3	0.275D-02
3	ELASTIC	-1.0	-229.8	-34.3	0.920D-03	-0.282D-02	-0.112D-02	236.9	0.262D-02
4	ELASTIC	0.0	-319.2	-36.3	0.129D-02	-0.392D-02	-0.119D-02	325.3	0.360D-02
82									
1	ELASTIC	-31.5	113.8	-155.7	-0.848D-03	0.153D-02	-0.509D-02	300.5	0.328D-02
2	ELASTIC	-7.0	102.7	-169.1	-0.503D-03	0.129D-02	-0.553D-02	311.6	0.340D-02
3	ELASTIC	-16.7	-14.6	-135.8	-0.146D-03	-0.112D-03	-0.444D-02	235.7	0.257D-02
4	ELASTIC	-0.3	-48.3	-143.3	0.192D-03	-0.592D-03	-0.469D-02	252.9	0.276D-02
83									
1	ELASTIC	-65.8	313.1	-128.9	-0.208D-02	0.412D-02	-0.421D-02	415.7	0.456D-02
2	ELASTIC	-33.4	353.2	-149.5	-0.164D-02	0.448D-02	-0.489D-02	452.4	0.497D-02
3	ELASTIC	-46.1	203.8	-153.8	-0.139D-02	0.269D-02	-0.503D-02	352.2	0.385D-02
4	ELASTIC	-14.8	213.3	-171.2	-0.105D-02	0.268D-02	-0.560D-02	369.9	0.405D-02
84									
1	ELASTIC	-37.4	425.5	-27.0	-0.290D-02	0.559D-02	-0.682D-03	477.6	0.525D-02
2	ELASTIC	-60.2	511.0	-32.8	-0.281D-02	0.653D-02	-0.107D-02	546.6	0.602D-02
3	ELASTIC	-79.5	378.5	-92.0	-0.251D-02	0.498D-02	-0.301D-02	452.8	0.497D-02
4	ELASTIC	-47.8	439.1	-107.2	-0.237D-02	0.559D-02	-0.350D-02	500.5	0.551D-02
85									
1	ELASTIC	-54.6	392.9	84.4	-0.227D-02	0.505D-02	0.276D-02	447.5	0.492D-02
2	ELASTIC	-34.3	445.0	124.6	-0.223D-02	0.561D-02	0.407D-02	511.0	0.563D-02
3	ELASTIC	-78.1	430.2	27.3	-0.270D-02	0.560D-02	0.891D-03	476.4	0.524D-02
4	ELASTIC	-57.7	512.2	44.9	-0.279D-02	0.653D-02	0.146D-02	548.8	0.605D-02
86									
1	ELASTIC	-0.0	267.7	133.0	-0.109D-02	0.329D-02	0.435D-02	353.1	0.388D-02
2	ELASTIC	54.7	261.5	165.4	-0.383D-03	0.299D-02	0.541D-02	373.1	0.411D-02
3	ELASTIC	-33.2	344.6	114.3	-0.181D-02	0.437D-02	0.374D-02	413.0	0.454D-02
4	ELASTIC	6.9	376.6	153.4	-0.144D-02	0.460D-02	0.501D-02	458.1	0.505D-02
87									
1	ELASTIC	32.7	147.6	104.8	-0.1 97D-03	0.168D-02	0.343D-02	225.8	0.249D-02
2	ELASTIC	63.1	119.2	106.8	0.292D-03	0.121D-02	0.349D-02	211.8	0.234D-02
3	ELASTIC	21.1	208.5	125.6	-0.586D-03	0.248D-02	0.411D-02	294.7	0.324D-02
4	ELASTIC	50.9	173.7	133.2	-0.991 D-04	0.199D-02	0.436D-02	280.5	0.309D-02
88									
1	ELASTIC	28.3	77.9	61.7	0.313D-04	0.843D-03	0.202D-02	126.8	0.140D-02
2	ELASTIC	39.2	53.8	50.4	0.263D-03	0.503D-03	0.165D-02	99.7	0.110D-02
3	ELASTIC	32.6	112.2	85.3	-0.541D-04	0.125D-02	0.279D-02	178.3	0.196D-02
4	ELASTIC	54.9	84.3	79.6	0.333D-03	0.813D-03	0.260D-02	156.5	0.173D-02
89									
1	ELASTIC	12.7	36.1	27.9	0.920D-05	0.392D-03	0.913D-03	57.8	0.638D-03
2	ELASTIC	15.5	21.2	17.3	0.105D-03	0.198D-03	0.567D-03	35.5	0.394D-03
3	ELASTIC	21.6	59.5	46.1	0.242D-04	0.644D-03	0.151D-02	95.4	0.105D-02
4	ELASTIC	29.0	39.5	33.7	0.196D-03	0.368D-03	0.110D-02	68.3	0.757D-03
90									

	1	ELASTIC	0.7	-9.6	4.4	0.474D-04	-0.121D-03	0.144D-03	12.6	0.138D-03
	2	ELASTIC	0.6	-13.2	1.5	0.808D-04	-0.226D-03	0.495D-04	18.7	0.207D-03
	3	ELASTIC	5.7	19.9	17.5	-0.103D-04	0.221D-03	0.571D-03	35.0	0.385D-03
	u	ELASTIC	7.5	8.3	8.6	0.579D-04	0.723D-04	0.281D-03	16.9	0.187D-03
91										
	1	ELASTIC	7.4	-202.8	-107.7	0.913D-03	-0.252D-02	-0.352D-02	278.3	0.306D-02
	2	ELASTIC	20.1	-254.2	-89.1	0.128D-02	-0.321D-02	-0.291D-02	306.5	0.337D-02
	3	ELASTIC	0.6	-387.8	-35.4	0.158D-02	-0.477D-02	-0.116D-02	393.0	0.435D-02
	4	ELASTIC	2.5	-469.7	-29.2	0.194D-02	-0.578D-02	-0.955D-03	473.7	0.524D-02
92										
	1	ELASTIC	24.5	91.4	-169.7	-0.691D-04	0.102D-02	-0.555D-02	305.2	0.333D-02
	2	ELASTIC	81.1	67.5	-150.2	0.723D-03	0.501D-03	-0.491D-02	270.8	0.297D-02
	3	ELASTIC	15.1	-78.7	-140.6	0.505D-03	-0.103D-02	-0.460D-02	258.6	0.282D-02
	4	ELASTIC	41.3	-115.0	-117.9	0.974D-03	-0.158D-02	-0.385D-02	247.7	0.270D-02
93										
	1	ELASTIC	16.2	377.2	-170.9	-0.133D-02	0.457D-02	-0.559D-02	473.4	0.522D-02
	2	ELASTIC	116.5	389.0	-168.6	-0.146D-03	0.431D-02	-0.551D-02	452.6	0.503D-02
	3	ELASTIC	25.7	213.9	-179.6	-0.551D-03	0.252D-02	-0.587D-02	371.1	0.407D-02
	4	ELASTIC	106.5	204.4	-168.2	0.481D-03	0.208D-02	-0.550D-02	341.0	0.377D-02
94										
	1	ELASTIC	-40.3	580.7	-25.3	-0.285D-02	0.730D-02	-0.828D-03	603.4	0.666D-02
	2	ELASTIC	88.3	732.7	-59.1	-0.189D-02	0.865D-02	-0.193D-02	700.3	0.780D-02
	3	ELASTIC	-14.7	501.7	-131.4	-0.222D-02	0.623D-02	-0.430D-02	557.7	0.615D-02
	4	ELASTIC	113.3	561.7	-171.0	-0.885D-03	0.644D-02	-0.559D-02	593.6	0.660D-02
95										
	1	ELASTIC	11.3	524.8	151.8	-0.199D-02	0.640D-02	0.496D-02	582.0	0.643D-02
	2	ELASTIC	37.7	588.9	216.7	-0.193D-02	0.709D-02	0.709D-02	683.4	0.755D-02
	3	ELASTIC	-23.5	584.0	61.0	-0.266D-02	0.727D-02	0.199D-02	605.4	0.669D-02
	4	ELASTIC	10.5	714.9	47.4	-0.277D-02	0.875D-02	0.155D-02	714.5	0.792D-02
96										
	1	ELASTIC	83.9	227.6	181.1	0.108D-03	0.246D-02	0.592D-02	371.7	0.410D-02
	2	ELASTIC	173.2	169.1	164.7	0.145D-02	0.136D-02	0.539D-02	332.5	0.369D-02
	3	ELASTIC	40.9	367.8	189.7	-0.989D-03	0.436D-02	0.620D-02	479.5	0.529D-02
	4	ELASTIC	183.0	414.2	295.7	0.570D-03	0.435D-02	0.967D-02	625.8	0.692D-02
97										
	1	ELASTIC	85.0	82.4	97.3	0.710D-03	0.669D-03	0.318D-02	188.2	0.208D-02
	2	ELASTIC	99.0	37.2	59.7	0.943D-03	0.962D-04	0.195D-02	129.1	0.143D-02
	3	ELASTIC	101.7	174.7	148.4	0.541D-03	0.173D-02	0.485D-02	298.6	0.330D-02
	4	ELASTIC	141.0	86.4	122.9	0.138D-02	0.490D-03	0.402D-02	246.0	0.272D-02
98										
	1	ELASTIC	45.5	35.6	36.7	0.415D-03	0.253D-03	0.120D-02	75.8	0.841D-03
	2	ELASTIC	33.5	14.7	15.6	0.352D-03	0.451D-04	0.511D-03	39.7	0.443D-03
	3	ELASTIC	55.9	56.8	64.8	0.580D-03	0.431D-03	0.212D-02	128.2	0.142D-02
	4	ELASTIC	60.8	31.2	37.7	0.621D-03	0.137D-03	0.123D-02	83.9	0.932D-03
99										
	1	ELASTIC	15.6	12.6	7.7	0.140D-03	0.923D-04	0.251D-03	19.6	0.220D-03
	2	ELASTIC	9.0	3.5	-3.4	0.962D-04	0.629D-05	-0.110D-03	9.8	0.109D-03
	3	LLASTIC	30.0	25.6	21.8	0.265D-03	0.193D-03	0.713D-03	47.0	0.524D-03
	4	ELASTIC	22.8	10.9	6.1	0.237D-03	0.413D-04	0.199D-03	22.4	0.253D-03
100										
	1	ELASTIC	1.0	-19.2	-1.1	0.901 D-OU	-0.240D-03	-0.354D-04	19.8	0.219D-03
	2	ELASTIC	0.9	-14.8	-3.9	0.704D-04	-0.185D-03	-0.128D-03	16.6	0.183D-03
	3	ELASTIC	7.1	1.8	1.4	0.795D-04	-0.617D-05	0.455D-04	6.8	0.762D-04
	4	ELASTIC	4.3	-1.6	-6.1	0.588D-04	-0.367D-04	-0.199D-03	11.8	0.129D-03
101										
	1	ELASTIC	28.9	-282.0	-64.4	0.150D-02	-0.358D-02	-0.211D-02	317.7	0.350D-02
	2	LLASTIC	37.6	-305.6	-19.8	0.170D-02	-0.391D-02	-0.647D-03	327.8	0.361D-02

	3	ELASTIC	2.6	-513.6	-21.1	0.214D-02	-0.638D-02	-0.689D-03	521.2	0.577D-02
	4	ELASTIC	3.8	-553.1	-6.3	0.229D-02	-0.681D-02	-0.206D-03	555.1	0.615D-02
102										
	1	ELASTIC	122.0	41.4	-111.6	0.133D-02	0.135D-04	-0.365D-02	221.1	0.243D-02
	2	ELASTIC	158.7	34.6	-31.7	0.181D-02	-0.219D-03	-0.104D-02	154.6	0.173D-02
	3	ELASTIC	66.2	-140.1	-85.1	0.138D-02	-0.199D-02	-0.273D-02	234.5	0.256D-02
	4	ELASTIC	80.9	-157.4	-25.2	0.163D-02	-0.226D-02	-0.822D-03	214.3	0.234D-02
103										
	1	ELASTIC	237.1	426.5	-153.5	0.118D-02	0.428D-02	-0.502D-02	455.7	0.514D-02
	2	ELASTIC	359.7	357.7	-65.8	0.297D-02	0.294D-02	-0.215D-02	376.4	0.434D-02
	3	ELASTIC	173.3	181.0	-134.7	0.140D-02	0.152D-02	-0.440D-02	293.0	0.327D-02
	4	ELASTIC	231.0	157.8	-44.3	0.220D-02	0.100D-02	-0.145D-02	218.4	0.250D-02
104										
	1	ELASTIC	307.9	791.8	-100.6	0.572D-03	0.848D-02	-0.329D-02	713.0	0.807D-02
	2	PLASTIC	577.7	954.4	-33.6	0.365D-02	0.128D-01	-0.165D-02	834.6	0.137D-01
	3	ELASTIC	286.6	549.5	-149.8	0.129D-02	0.559D-02	-0.490D-02	542.2	0.613D-02
	4	ELASTIC	463.0	604.3	-47.2	0.324D-02	0.555D-02	-0.154D-02	553.6	0.639D-02
105										
	1	PLASTIC	514.7	962.9	4.3	0.963D-02	0.177D+00	0.339D-03	834.6	0.207D+00
	2	PLASTIC	647.4	939.1	-34.5	0.627D-01	0.205D+00	-0.358D-01	834.6	0.277D+00
	3	PLASTIC	431.6	955.5	56.9	-0.620D-04	0.224D-01	0.426D-02	834.6	0.229D-01
	4	PLASTIC	578.6	956.0	17.9	0.551D-02	0.300D-01	0.185D-02	834.6	0.344D-01
106										
	1	PLASTIC	323.5	737.9	266.7	0.578D-03	0.966D-02	0.102D-01	834.6	0.108D-01
	2	PLASTIC	397.2	925.5	129.0	-0.135D-01	0.150D+00	0.801D-01	834.6	0.169D+00
	3	PLASTIC	370.2	933.0	107.1	-0.297D-03	0.160D-01	0.594D-02	834.6	0.159D-01
	4	PLASTIC	462.0	956.3	58.9	-0.324D-02	0.173D+00	0.390D-01	834.6	0.196D+00
107										
	1	ELASTIC	209.7	33.0	165.4	0.244D-02	-0.446D-03	0.541D-02	346.7	0.381D-02
	2	PLASTIC	298.2	918.7	112.0	-0.206D-01	0.112D+00	0.552D-01	834.6	0.121D+00
	3	ELASTIC	256.7	371.2	293.4	0.165D-02	0.352D-02	0.959D-02	605.4	0.671D-02
	4	PLASTIC	386.3	942.8	86.9	-0.131D-01	0.127D+00	0.505D-01	834.6	0.139D+00
108										
	1	ELASTIC	153.6	45.0	104.2	0.171D-02	-0.698D-04	0.341D-02	226.5	0.250D-02
	2	ELASTIC	36.9	-3.4	9.5	0.467D-03	-0.191D-03	0.315D-03	42.1	0.464D-03
	3	PLASTIC	626.6	311.4	366.1	0.397D-01	-0.781D-04	0.834D-01	834.6	0.663D-01
	4	ELASTIC	230.8	33.0	36.4	0.270D-02	-0.530D-03	0.119D-02	225.2	0.251D-02
109										
	1	ELASTIC	55.4	21.0	26.9	0.595D-03	0.334D-04	0.879D-03	67.2	0.748D-03
	2	ELASTIC	-26.1	5.0	3.9	-0.341D-03	0.167D-03	0.127D-03	29.7	0.326D-03
	3	ELASTIC	109.1	38.5	61.9	0.117D-02	0.343D-04	0.202D-02	143.1	0.159D-02
	4	ELASTIC	0.3	0.1	18.1	0.343D-05	0.782D-07	0.592D-03	31.4	0.342D-03
110										
	1	ELASTIC	15.4	5.4	0.8	0.167D-03	0.364D-05	0.264D-04	13.6	0.154D-03
	2	ELASTIC	-31.1	-0.9	-2.3	-0.378D-03	0.115D-03	-0.742D-04	30.9	0.342D-03
	3	ELASTIC	34.3	7.7	17.2	0.390D-03	-0.443D-04	0.564D-03	43.2	0.478D-03
	4	ELASTIC	-31.1	0.1	-2.1	-0.383D-03	0.128D-03	-0.702D-04	31.4	0.348D-03
111										
	1	ELASTIC	0.2	0.7	-8.1	-0.723D-06	0.814D-05	-0.264D-03	14.0	0.153D-03
	2	ELASTIC	-10.2	-1.1	-5.0	-0.121D-03	0.281D-04	-0.163D-03	13.0	0.144D-03
	3	ELASTIC	4.7	4.9	-4.8	0.375D-04	0.412D-04	-0.158D-03	9.7	0.107D-03
	4	ELASTIC	-23.6	1.0	-4.2	-0.294D-03	0.108D-03	-0.138D-03	25.2	0.278D-03
112										
	1	ELASTIC	-1.5	-8.4	-3.6	0.155D-04	-0.975D-04	-0.117D-03	10.0	0.110D-03
	2	ELASTIC	-0.3	-2.5	-1.7	0.642D-05	-0.294D-04	-0.549D-04	3.7	0.411D-04
	3	ELASTIC	-0.6	-3.6	-8.9	0.750D-05	-0.418D-04	-0.293D-03	15.9	0.173D-03
	4	ELASTIC	-3.4	-1.2	-3.7	-0.369D-04	-0.119D-05	-0.120D-03	7.0	0.770D-04

VALUES OF J- INTEGRAL

INTEGRATION PATH NO	J
1	0.659384D+02
2	0.110323D+03
3	0.114524D+03
4	0.113701D+03
5	0.116316D+03
6	0.117556D+03
7	0.118244D+03
8	0.118374D+03

AVREAGE J-INTEGRAL (IGNORING THE FIRST 1 PATYS) = 0.115577D+03

LOADING TIME FUNCTION TABLE

STEP	TIME	LOAD FUNCTION NO. 1
1	1.0000	0.0350
2	2.0000	0.1900

S O L U T I O N   T I M E   L O G

FOR PROBLEM

EDGE NOTCH SPECIMEN MESH #5

```
INPUT PHASE . . . . . . . . . . . . . . . . . .          0.0

ASSEMBLAGE OF LINEAR STIFFNESS,
  EFFECTIVE STIFFNESS, AND MASS MATRICES . . . .          0.0

TRIANGULARIZATION OF EFFECTIVE STIFFNESS MATRIX          0.0

STEP-BY-STEP SOLUTION (     2 TIME STEPS)

   CALCULATION OF EFFECTIVE LOAD VECTORS .          0.0
   UPDATING EFFECTIVE STIFFNESS MATRICES
     AND LOAD VECTORS FOR NONLINEARITIES .          0.0
   SOLUTION OF EQUATIONS . . . . . . . . .          0.0
   EQUILIBRIUM ITERATIONS  . . . . . . . .          0.0
   CALCULATION AND PRINTING OF DISPLACE-
     MENTS, VELOCITIES, AND ACCELERATIONS           0.0
   CALCULATION AND PRINTING OF STRESSES  .          0.0

                              STEP-BY-STEP TOTAL          0.0


T O T A L   S O L U T I O N   T I M E . . . . .          0.0
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I N P U T   C A R D   I M A G E S

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CARD
NO./COL. 1........10........20........30........40........50........60........70........80
    1        EDGE NOTCH SPECIMEN MESH #5
    2         383100111          1     1     1
    3                                  1
    4     0.0        1.0         8.0
    5
    6          1          1    -1                        0.0        40.0
    7          2               -1                        1.0        40.0
    8          3               -1                        2.0        40.0
    9          4               -1                        3.0        40.0
   10          5               -1                        4.0        40.0
   11          6               -1                        5.0        40.0
   12          7               -1                        6.0        40.0
   13          8               -1                        7.0        40.0
   14          9               -1                        8.0        40.0
   15         10               -1                        9.0        40.0
   16         11               -1                       10.0        40.0
   17         12               -1                       11.0        40.0
   18         13               -1                       12.0        40.0
   19         14               -1                       13.0        40.0
   20         15               -1                       14.0        40.0
   21         16               -1                       15.0        40.0
   22         17               -1                       16.0        40.0
   23         18               -1                       17.0        40.0
   24         19               -1                       18.0        40.0
   25         20               -1                       19.0        40.0
   26         21               -1                       20.0        37.0
   27         22                                         0.0        37.0
   28         23                                         2.0        37.0
   29         24                                         4.0        37.0
   30         25                                         6.0        37.0
   31         26                                         8.0        37.0
   32         27                                        10.0        37.0
   33         28                                        12.0        37.0
   34         29                                        14.0        37.0
   35         30                                        16.0        37.0
   36         31                                        18.0        37.0
   37         32                                        20.0        37.0
   38         33                                         0.0        34.0
   39         34                                         1.0        34.0
   40         35                                         2.0        34.0
   41         36                                         3.0        34.0
   42         37                                         4.0        34.0
   43         38                                         5.0        34.0
   44         39                                         6.0        34.0
   45         40                                         7.0        34.0
   46         41                                         8.0        34.0
   47         42                                         9.0        34.0
   48         43                                        10.0        34.0
   49         44                                        11.0        34.0
   50         45                                        12.0        34.0
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CARD
NO./COL. 1........10........20........30........40........50........60........70........80
  51       46                                       13.0      34.0
  52       47                                       14.0      34.0
  53       48                                       15.0      34.0
  54       49                                       16.0      34.0
  55       50                                       17.0      34.0
  56       51                                       18.0      34.0
  57       52                                       19.0      34.0
  58       53                                       20.0      34.0
  59       54                                       0.0       31.0
  60       55                                       2.0       31.0
  61       56                                       4.0       31.0
  62       57                                       6.0       31.0
  63       58                                       8.0       31.0
  64       59                                       10.0      31.0
  65       60                                       12.0      31.0
  66       61                                       14.0      31.0
  67       62                                       16.0      31.0
  68       63                                       18.0      31.0
  69       64                                       20.0      31.0
  70       65                                       0.0       28.0
  71       66                                       1.0       28.0
  72       67                                       2.0       28.0
  73       68                                       3.0       28.0
  74       69                                       4.0       28.0
  75       70                                       5.0       28.0
  76       71                                       6.0       29.0
  77       72                                       7.0       28.0
  78       73                                       8.0       28.0
  79       74                                       9.0       28.0
  80       75                                       10.0      28.0
  81       76                                       11.0      28.0
  82       77                                       12.0      28.0
  83       78                                       13.0      28.0
  84       79                                       14.0      28.0
  85       80                                       15.0      28.0
  86       81                                       16.0      28.0
  87       82                                       17.0      28.0
  88       83                                       18.0      28.0
  89       84                                       19.0      28.0
  90       85                                       20.0      28.0
  91       86                                       0.0       25.0
  92       87                                       2.0       25.0
  93       88                                       4.0       25.0
  94       89                                       6.0       25.0
  95       90                                       8.0       25.0
  96       91                                       10.0      25.0
  97       92                                       12.0      25.0
  98       93                                       14.0      25.0
  99       94                                       16.0      25.0
 100       95                                       18.0      25.0
```

(B.3)

CARD
NO./COL. 1........10........20........30........40........50........60........70........80

101	96	20.0	25.0
102	97	0.0	22.0
103	98	1.0	22.0
104	99	2.0	22.0
105	100	3.0	22.0
106	101	4.0	22.0
107	102	5.0	22.0
108	103	6.0	22.0
109	104	7.0	22.0
110	105	8.0	22.0
111	106	9.0	22.0
112	107	10.0	22.0
113	108	11.0	22.0
114	109	12.0	22.0
115	110	13.0	22.0
116	111	14.0	22.0
117	112	15.0	22.0
118	113	16.0	22.0
119	114	17.0	22.0
120	115	18.0	22.0
121	116	19.0	22.0
122	117	20.0	22.0
123	118	0.0	20.0
124	119	2.0	20.0
125	120	4.0	20.0
126	121	6.0	20.0
127	122	8.0	20.0
128	123	10.0	20.0
129	124	12.0	20.0
130	125	14.0	20.0
131	126	16.0	20.0
132	127	18.0	20.0
133	128	20.0	20.0
134	129	0.0	18.0
135	130	1.0	18.0
136	131	2.0	18.0
137	132	3.0	18.0
138	133	4.0	18.0
139	134	5.0	18.0
140	135	6.0	18.0
141	136	7.00	18.0
142	137	8.00	18.0
143	138	9.0	18.0
144	139	10.0	18.0
145	140	11.0	18.0
146	141	12.0	18.0
147	142	13.0	18.0
148	143	14.0	18.0
149	144	15.0	18.0
150	145	16.0	18.0

CARD NO./COL.	1........10........20........30........40........	........50........	........60........70........80
151	146	17.0	18.0
152	147	18.0	18.0
153	148	19.0	18.0
154	149	20.0	18.0
155	150	0.0	16.5
156	151	2.0	16.5
157	152	4.0	16.5
158	153	6.0	16.5
159	154	8.0	16.5
160	155	10.0	16.5
161	156	12.0	16.5
162	157	14.0	16.5
163	158	16.0	16.5
164	159	18.0	16.5
165	160	20.0	16.5
166	161	0.0	15.0
167	162	1.0	15.0
168	163	2.0	15.0
169	164	3.0	15.0
170	165	4.0	15.0
171	166	5.0	15.0
172	167	6.0	15.0
173	168	7.0	15.0
174	169	8.0	15.0
175	170	9.0	15.0
176	171	10.0	15.0
177	172	11.0	15.0
178	173	12.0	15.0
179	174	13.0	15.0
180	175	14.0	15.0
181	176	15.0	15.0
182	177	16.0	15.0
183	178	17.0	15.0
184	179	18.0	15.0
185	180	19.0	15.0
186	181	20.0	15.0
187	182	0.0	13.5
188	183	2.0	13.5
189	184	4.0	13.5
190	185	6.0	13.5
191	186	8.0	13.5
192	187	10.0	13.5
193	188	12.0	13.5
194	189	14.0	13.5
195	190	16.0	13.5
196	191	18.0	13.5
197	192	20.0	13.5
198	193	0.0	12.0
199	194	1.0	12.0
200	195	2.0	12.0

(B.3)

CARD NO./COL 1.... 10 ... ...20... ... 30 .. . ..40 ....50........60........70........80

CARD NO./COL	1	50	60
201	196	3.0	12.0
202	197	4.0	12.0
203	198	5.0	12.0
204	199	6.0	12.0
205	200	7.0	12.0
206	201	8.0	12.0
207	202	9.0	12.0
208	203	10.0	12.0
209	204	11.0	12.0
210	205	12.0	12.0
211	206	13.0	12.0
212	207	14.0	12.0
213	208	15.0	12.0
214	209	16.0	12.0
215	210	17.0	12.0
216	211	18.0	12.0
217	212	19.0	12.0
218	213	20.0	12.0
219	214	0.0	10.5
220	215	2.0	10.5
221	216	4.0	10.5
222	217	6.0	10.5
223	218	8.0	10.5
224	219	10.0	10.5
225	220	12.0	10.5
226	221	14.0	10.5
227	222	16.0	10.5
228	223	18.0	10.5
229	224	20.0	10.5
230	225	0.0	9.0
231	226	1.0	9.0
232	227	2.0	9.0
233	228	3.0	9.0
234	229	4.0	9.0
235	230	5.0	9.0
236	231	6.0	9.0
237	232	7.0	9.0
238	233	8.0	9.0
239	234	9.0	9.0
240	235	10.0	9.0
241	236	11.0	9.0
242	237	12.0	9.0
243	238	13.0	9.0
244	239	14.0	9.0
245	240	15.0	9.0
246	241	16.0	9.0
247	242	17.0	9.0
248	243	18.0	9.0
249	244	19.0	9.0
250	245	20.0	9.0

CARD NO./COL. 1........10........20........30........40........50........60........70........80

CARD NO.			
251	246	0.0	7.5
252	247	2.0	7.5
253	248	4.0	7.5
254	249	6.0	7.5
255	250	8.0	7.5
256	251	10.0	7.5
257	252	12.0	7.5
258	253	14.0	7.5
259	254	16.0	7.5
260	255	18.0	7.5
261	256	20.0	7.5
262	257	0.0	6.0
263	258	1.0	6.0
264	259	2.0	6.0
265	260	3.0	6.0
266	261	4.0	6.0
267	262	5.0	6.0
268	263	6.0	6.0
269	264	7.0	6.0
270	265	8.0	6.0
271	266	9.0	6.0
272	267	10.0	6.0
273	268	11.0	6.0
274	269	12.0	6.0
275	270	13.0	6.0
276	271	14.0	6.0
277	272	15.0	6.0
278	273	16.0	6.0
279	274	17.0	6.0
280	275	18.0	6.0
281	276	19.0	6.0
282	277	20.0	6.0
283	278	0.0	5.0
284	279	2.0	5.0
285	280	4.0	5.0
286	281	6.0	5.0
287	282	8.0	5.0
288	283	10.0	5.0
289	284	12.0	5.0
290	285	14.0	5.0
291	286	16.0	5.0
292	287	18.0	5.0
293	288	20.0	5.0
294	289	0.0	4.0
295	290	1.0	4.0
296	291	2.0	4.0
297	292	3.0	4.0
298	293	4.0	4.0
299	294	5.0	4.0
300	295	6.0	4.0

CARD NO./COL.	1........10........20........30........40........	..50........	..60........70........80
301	296	7.0	4.0
302	297	8.0	4.0
303	298	9.0	4.0
304	299	10.0	4.0
305	300	11.0	4.0
306	301	12.0	4.0
307	302	13.0	4.0
308	303	14.0	4.0
309	304	15.0	4.0
310	305	16.0	4.0
311	306	17.0	4.0
312	307	18.0	4.0
313	308	19.0	4.0
314	309	20.0	4.0
315	310	0.0	3.0
316	311	2.0	3.0
317	312	4.0	3.0
318	313	6.0	3.0
319	314	8.0	3.0
320	315	10.0	3.0
321	316	12.0	3.0
322	317	14.0	3.0
323	318	16.0	3.0
324	319	18.0	3.0
325	320	20.0	3.0
326	321	0.0	2.0
327	322	1.0	2.0
328	323	2.0	2.0
329	324	3.0	2.0
330	325	4.0	2.0
331	326	5.0	2.0
332	327	6.0	2.0
333	328	7.0	2.0
334	329	8.0	2.0
335	330	9.0	2.0
336	331	10.0	2.0
337	332	11.0	2.0
338	333	12.0	2.0
339	334	13.0	2.0
340	335	14.0	2.0
341	336	15.0	2.0
342	337	16.0	2.0
343	338	17.0	2.0
344	339	18.0	2.0
345	340	19.0	2.0
346	341	20.0	2.0
347	342	0.0	1.0
348	343	2.0	1.0
349	344	4.0	1.0
350	345	6.0	1.0

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CARD NO./COL.	1 ...		10 ...	20 ...		30 ...		40 ...	50 ...	60 ...	70 ...	80
351	346								8.0	1.0		
352	347								9.5	0.5		
353	348								10.0	0.5		
354	349								10.5	0.5		
355	350								12.0	1.0		
356	351								14.0	1.0		
357	352								16.0	1.0		
358	353								18.5	1.0		
359	354								20.0	1.3		
360	355			1					0.0	0.0		
361	356			1					1.0	0.0		
362	357			1					2.0	0.0		
363	358			1					3.0	0.0		
364	359			1					4.0	0.0		
365	360			1					5.0	0.0		
366	361			1					6.0	0.0		
367	362			1					7.0	0.0		
368	363			1					8.0	0.0		
369	364			1					9.5	0.0		
370	365			1					10.0	0.0		
371	366			1					10.0	0.0		
372	367			1					10.0	0.0		
373	368			1					10.0	0.0		
374	369			1					10.0	0.0		
375	370			1					10.0	0.0		
376	371			1					10.0	0.0		
377	372			1					10.0	0.0		
378	373			1					10.0	0.0		
379	374			1					10.0	0.0		
380	375								10.5	0.0		
381	376								12.0	0.0		
382	377								13.0	0.0		
383	378								14.0	0.0		
384	379								15.0	0.0		
385	380								16.0	0.0		
386	381								17.5	0.0		
387	382								19.0	0.0		
388	383								19.5	0.288		
389		1	10		0	0	0		20.0	0.577		
390									21			
391	2 112		1	2		8		2		1	3	1
392	1											
393	2000.		0.33	70.								
394	1	8	1	1				0.33				
395	33	35	3	1	34	23	2	22				
396	2	8	1	1				0.33				
397	35	37	5	3	36	24	4	23				
398	3	8	1	1				0.33				
399	37	39	7	5	38	25	6	24				
400	4	8	1	1				0.33				

CARD NO./COL. 1........10........20........30........40........50........60........70........80

CARD NO.									
401	39	41	9	7	40	26	8	25	
402	5	8	1	1					0.33
403	41	43	11	9	42	27	10	26	
404	6	8	1	1					0.33
405	43	45	13	11	44	28	12	27	
406	7	8	1	1					0.33
407	45	47	15	13	46	29	14	28	
408	8	8	1	1					0.33
409	47	49	17	15	48	30	16	29	
410	9	8	1	1					0.33
411	49	51	19	17	50	31	18	30	
412	10	8	1	1					0.33
413	51	53	21	19	52	32	20	31	
414	11	8	1	1					0.33
415	65	67	35	33	66	55	34	54	
416	12	8	1	1					0.33
417	67	69	37	35	68	56	36	55	
418	13	8	1	1					0.33
419	69	71	39	37	70	57	38	56	
420	14	8	1	1					0.33
421	71	73	41	39	72	58	40	57	
422	15	8	1	1					0.33
423	73	75	43	41	74	59	42	58	
424	16	8	1	1					0.33
425	75	77	45	43	76	60	44	59	
426	17	8	1	1					0.33
427	77	79	47	45	78	61	46	60	
428	18	8	1	1					0.33
429	79	81	49	47	80	62	48	61	
430	19	8	1	1					0.33
431	81	83	51	49	82	63	50	62	
432	20	8	1	1					0.33
433	83	85	53	51	84	64	52	63	
434	21	8	1	1					0.33
435	97	99	67	65	98	87	66	86	
436	22	8	1	1					0.33
437	99	101	69	67	100	88	68	87	
438	23	8	1	1					0.33
439	101	103	71	69	102	89	70	88	
440	24	8	1	1					0.33
441	103	105	73	71	104	90	72	89	
442	25	8	1	1					0.33
443	105	107	75	73	106	91	74	90	
444	26	8	1	1					0.33
445	107	109	77	75	108	92	76	91	
446	27	8	1	1					0.33
447	109	111	79	77	110	93	78	92	
448	28	8	1	1					0.33
449	111	113	81	79	112	94	80	93	
450	29	8	1	1					0.33

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CARD
NO./COL. 1.........10.........20.........30.........40.........50.........60.........70.........80

451	113	115	83	81	114	95	82	94	
452	30	8	1	1					0.33
453	115	117	85	83	116	96	84	95	
454	31	8	1	1					0.33
455	129	131	99	97	130	119	98	118	
456	32	8	1	1					0.33
457	131	133	101	99	132	120	100	119	
458	33	8	1	1					0.33
459	133	135	103	101	134	121	102	120	
460	34	8	1	1					0.33
461	135	137	105	103	136	122	104	121	
462	35	8	1	1					0.33
463	137	139	107	105	138	123	106	122	
464	36	8	1	1					0.33
465	139	141	109	107	140	124	108	123	
466	37	8	1	1					0.33
467	141	143	111	109	142	125	110	124	
468	38	8	1	1					0.33
469	143	145	113	111	144	126	112	125	
470	39	8	1	1					0.33
471	145	147	115	113	146	127	114	126	
472	40	8	1	1					0.33
473	147	149	117	115	148	128	116	127	
474	41	8	1	1					0.33
475	161	163	131	129	162	151	130	150	
476	42	8	1	1					0.33
477	163	165	133	131	164	152	132	151	
478	43	8	1	1					0.33
479	165	167	135	133	166	153	134	152	
480	44	8	1	1					0.33
481	167	169	137	135	168	154	136	153	
482	45	8	1	1					0.33
483	169	171	139	137	170	155	138	154	
484	46	8	1	1					0.33
485	171	173	141	139	172	156	140	155	
486	47	8	1	1					0.33
487	173	175	143	141	174	157	142	156	
488	48	8	1	1					0.33
489	175	177	145	143	176	158	144	157	
490	49	8	1	1					0.33
491	177	179	147	145	178	159	146	158	
492	50	8	1	1					0.33
493	179	181	149	147	180	160	148	159	
494	51	8	1	1					0.33
495	193	195	163	161	194	183	162	182	
496	52	8	1	1					0.33
497	195	197	165	163	196	184	164	183	
498	53	8	1	1					0.33
499	197	199	167	165	198	185	166	184	
500	54	8	1	1					0.33

(B.3)

CARD NO./COL.	1.......10	20		30		40		.........50.........60.........70.........80	
531	199	201	159	167	200	185	168	185	
502	55	8	1	1					0.33
5"3	201	203	171	169	202	187	170	186	
504	55	8	1	1					0.33
555	203	205	173	171	204	183	172	187	
506	57	8	1	1					0.33
507	205	207	175	173	206	189	174	188	
508	58	3	1	1					0.33
509	207	209	177	175	208	190	176	189	
513	59	3	1	1					0.33
i11	209	211	179	177	210	191	178	190	
512	60	8	1	1					0.33
513	211	213	181	179	212	192	180	191	
414	61	8	1	1					0.33
415	225	227	195	193	226	215	194	214	
516	62	8	1	1					0.33
517	227	229	197	195	228	216	196	215	
518	63	8	1	1					0.33
514	229	231	199	197	230	217	198	216	
520	64	3	1	1					0.33
521	231	233	201	199	232	218	200	217	
522	65	8	1	1					0.33
523	233	235	203	201	234	219	202	218	
524	66	8	1	1					0.33
525	235	237	205	203	236	220	204	219	
526	67	8	1	1					0.33
527	237	239	207	205	238	221	206	220	
528	68	8	1	1					0.33
529	239	241	209	207	240	222	208	221	
530	69	3	1	1					0.33
531	241	243	211	209	242	223	210	222	
532	70	8	1	1					0.33
533	243	245	213	211	244	224	212	223	
534	71	8	1	1					0.33
535	257	259	227	225	258	247	226	246	
536	72	8	1	1					0.33
537	259	261	229	227	260	248	228	247	
538	73	8	1	1					0.33
539	261	263	231	229	262	249	230	248	
540	74	3	1	1					0.33
541	263	265	233	231	264	250	232	249	
542	75	8	1	1					0.33
543	265	267	235	233	266	251	234	250	
544	76	8	1	1					0.33
545	267	269	237	235	268	252	236	251	
546	77	8	1	1					0.33
547	269	271	239	237	270	253	238	252	
548	78	3	1	1					0.33
549	271	273	241	239	272	254	240	253	
550	79	8	1	1					0.33

(B.3)

CARD
NO./COL. 1........10.........20.........30.........40.........50.........60.........70.........80

551	273	275	243	241	274	255	242	254	
552	80	8	1	1					0.33
553	275	277	245	243	276	256	244	255	
554	81	8	1	1					0.33
555	289	291	259	257	290	279	258	278	
556	82	8	1	1					0.33
557	291	293	261	259	292	280	260	279	
558	83	8	1	1					0.33
559	293	295	263	261	294	281	262	280	
560	84	8	1	1					0.33
561	295	297	265	263	296	282	264	281	
562	85	8	1	1					0.33
563	297	299	267	265	298	283	266	282	
564	86	8	1	1					0.33
565	299	301	269	267	300	284	268	283	
566	87	8	1	1					0.33
567	301	303	271	269	302	285	270	284	
568	88	8	1	1					0.33
569	303	305	273	271	304	286	272	285	
570	89	8	1	1					0.33
571	305	307	275	273	306	287	274	286	
572	90	8	1	1					0.33
573	307	309	277	275	308	288	276	287	
574	91	8	1	1					0.33
575	321	323	291	289	322	311	290	310	
576	92	8	1	1					0.33
577	323	325	293	291	324	312	292	311	
578	93	8	1	1					0.33
579	325	327	295	293	326	313	294	312	
580	94	8	1	1					0.33
581	327	329	297	295	328	314	296	313	
582	95	8	1	1					0.33
583	329	331	299	297	330	315	298	314	
584	96	8	1	1					0.33
585	331	333	301	299	332	316	300	315	
586	97	8	1	1					0.33
587	333	335	303	301	334	317	302	316	
588	98	8	1	1					0.33
589	335	337	305	303	336	318	304	317	
590	99	8	1	1					0.33
591	337	339	307	305	338	319	306	318	
592	100	8	1	1					0.33
593	339	341	309	307	340	320	308	319	
594	101	8	1	1					0.33
595	355	357	323	321	356	343	322	342	
596	102	8	1	1					0.33
597	357	359	325	323	358	344	324	343	
598	103	8	1	1					0.33
599	359	361	327	325	360	345	326	344	
600	104	8	1	1					0.33

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CARD
NO./COL. 1........10........20 .......30..... ..40.........50.........60.........70........80
 601          361    363    329    327    362    346    328    345
 602          105      9      1      1                            0.33
 603          363    365    307    329    364    366    347    346
 604          106      8      1      1                            0.33
 605          367    369    331    329    368    343    330    347
 606          107      8      1      1                            0.33
 607          369    371    333    331    370    349    332    348
 608          108      8      1      1                            0.33
 609          373    375    333    371    374    350    349    372
 610          109      8      1      1                            0.33
 611          375    377    335    333    376    351    334    350
 612          110      8      1      1                            0.33
 613          377    379    337    335    378    352    336    351
 614          111      8      1      1                            0.33
 615          379    381    339    337    380    353    338    352
 616          112      8      1      1                            0.33
 617          381    383    341    339    382    354    340    353
 618
 619            8
 620          365    366    367    368    369    370    371    372    373
 621            1      5
 622        0.0           0.0           1.0          0.035        4.0          0.5          7.0          0.8
 623        10.0          0.9
 624            1      3      1    2.0
 625            2      3      1    2.0
 626            3      3      1    2.0
 627            4      3      1    2.0
 628            5      3      1    2.0
 629            6      3      1    2.0
 630            7      3      1    2.0
 631            8      3      1    2.0
 632            9      3      1    2.0
 633           10      3      1    2.0
 634           11      3      1    2.0
 635           12      3      1    2.0
 636           13      3      1    2.0
 637           14      3      1    2.0
 638           15      3      1    2.0
 639           16      3      1    2.0
 640           17      3      1    2.0
 641           18      3      1    2.0
 642           19      3      1    2.0
 643           20      3      1    2.0
 644           21      3      1    2.0
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