

Table a1-b This is what part of the interactive GENTEXT session actually looks like to the GENOPT user. See Table a1 for the complete equivellipse.INP file, some data entries in which correspond to the GENOPT user's responses given in this table. The GENOPT user's responses to GENTEXT prompts are presented here in **bold face**.

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PART 1 of Table a1-b (the beginning of the interactive session)

```
ENTER THE GENERIC CASE NAME: equivellipse
ARE YOU CORRECTING, ADDING TO, OR USING equivellipse.INP ? (TYPE y OR
n): n
```

The purpose of GENOPT (GENERAL OPTimization) is to generate a user-friendly system of programs for optimizing anything you want. GENOPT is designed to handle problems with small data bases, not large finite element models. Before you start using GENOPT please read the file GENOPT.STORY and study the cases, located in the subdirectories under genopt/case.

You have chosen the following name for this case: equivellipse. Henceforth, this will be called the "generic" name. After you have completed your tasks in GENOPT, you and other users will be able to optimize specific things that fit within the class of optimization problems that you have called equivellipse.

Your tasks in GENOPT are:

1. To provide variable names, definitions and helping paragraphs that will make it easy for others to optimize things that fit within the problem class equivellipse
2. To complete subroutines BEHX1, BEHX2, BEHX3, . . . BEHXn which calculate equivellipse behavior for a given design;

SUBROUTINE OBJECT, which calculates the objective to be minimized; and/or to add any other subroutines, common blocks, utilities, etc. that you may wish.

3. To compile and collect all pertinent software that both you and GENOPT have written in order to generate the absolute elements: BEGIN.EXE, DECIDE.EXE, MAINSETUP.EXE, OPTIMIZE.EXE, and CHANGE.EXE.

With respect to Item 2, note that in the generic case, equivellipse, the GENOPT user decided to "flesh out" STRUCT instead of "fleshing out" the "behavioral" routines, BEHXi, I = 1, 2, 3, ...

STARTING PROMPT INDEX (integer from 1 to 10. Try 5):**5**

K= 5

INCREMENT FOR PROMPT INDEX (integer from 1 to 10. Try 5):**5**

DK= 5

CHOOSE: 0 or 1:

(0 means "introductory explanatory text")
(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **0**

TYPE= 0

PROVIDE INTRODUCTORY EXPLANATORY TEXT

this is explanatory text

this is explanatory text

ANY MORE LINES IN THIS PARAGRAPH? (y or <cr> or n): **y**

ANSWER=y

one more line

one more line

ANY MORE LINES IN THIS PARAGRAPH? (y or <cr> or n): **n**

ANSWER=n

CHOOSE: 0 or 1:

(0 means "introductory explanatory text")

(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**

TYPE= 1

=====
You will next be asked to provide information
about a new variable that will play a role in your program.
The following items relative to this new variable will be
asked of you:

1. A name of the variable (six characters or less).
2. The role of the variable in your program.
3. Is the variable an array? (If yes, give number of rows, NROWS and columns, NCOLS.)
4. A one-line definition of the variable.
5. Do you want to include a "help" paragraph that explains more about the variable than the one-line definition?
6. If you answer 5. with Y, you provide a help paragraph.

Hit RETURN.

<cr>

The variable can have one of the following roles:

- 1 = a possible decision variable for optimization, typically a dimension of a structure.
- 2 = a constant parameter (cannot vary as design evolves), typically a control integer or a material property, but not a load, allowable, or factor of safety, which are asked for later.
- 3 = a parameter characterizing the environment, such

- as a load component or a temperature.
- 4 = a quantity that describes the response of the structure, (e.g. stress, buckling load, frequency)
- 5 = an allowable, such as maximum allowable stress, minimum allowable frequency, etc.
- 6 = a factor of safety
- 7 = the design objective (e.g. weight)

NOTE: ALWAYS START WITH A ROLE = 1 OR A ROLE = 2 VARIABLE!

=====

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS): **npoint**

VNAME=npoint

IDENTIFY ROLE OF npoint (1 or 2 or 3 or 4 or 5 or 6 or 7):

1 = decision variable candidate(e.g.length, width, thickness)

2 = fixed parameter (e.g. control integer, material property)

3 = environmental factor (e.g. load, temperature)

4 = response quantity (e.g. stress, buckling load, frequency)

5 = allowable (e.g. maximum stress, minimum frequency)

6 = factor of safety

7 = objective (e.g. minimum weight, minimum cost)

CHOOSE: 1 or 2 or 3 or 4 or 5 or 6 or 7: **1**

IROLEV= 1

Is the variable npoint an array? **n**

ANSWER=n

PROVIDE A DEFINITION FOR npoint. (LESS THAN 60 CHARACTERS!)

number of x-coordinates

npoint = number of x-coordinates

DO YOU WANT TO INCLUDE A "HELP" PARAGRAPH? (y or n): **y**

(lines skipped to save space)

PART 2 of Table a1-b (GENOPT user establishes an array)

ANY MORE DECISION VARIABLE CANDIDATES (ROLE 1 VARIABLES)

OR FIXED PARAMETERS (e.g. material) (ROLE 2 VARIABLES)? **y**

ANSWER=y

CHOOSE ANOTHER DECISION VARIABLE CANDIDATE (ROLE 1 VARIABLE)

OR FIXED PARAMETER (ROLE 2 VARIABLE).

CHOOSE: 0 or 1:
 (0 means "introductory explanatory text")
 (1 means "one-line input datum prompt")
 CHOOSE: 0 or 1: **1**
 TYPE= 1
 PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS): **xinput**
 VNAME=xinput
 IDENTIFY ROLE OF xinput (1 or 2 or 3 or 4 or 5 or 6 or 7):
 1 = decision variable candidate(e.g.length, width, thickness)
 2 = fixed parameter (e.g. control integer, material property)
 3 = environmental factor (e.g. load, temperature)
 4 = response quantity (e.g. stress, buckling load, frequency)
 5 = allowable (e.g. maximum stress, minimum frequency)
 6 = factor of safety
 7 = objective (e.g. minimum weight, minimum cost)
 CHOOSE: 1 or 2 or 3 or 4 or 5 or 6 or 7: **2**
 IROLEV= 2
 IDENTIFY TYPE FOR VARIABLE xinput (1 or 2):
 1 = integer
 2 = floating point
 CHOOSE: 1 or 2: **2**
 ITYPEV= 2
 Is the variable xinput an array? **y**
 ANSWER=y
 Do you want to establish new dimension(s) for xinput?
 If you answer "no", GENOPT will use the dimensions of the last
 array () for which dimension(s) were established.
 The row index would be named "-----", with the definition:
 "-----".
 In this case xinput would be dimensioned xinput(0).
 If you want either or both of the following:
 1. new dimension(s) for xinput and/or
 2. new name(s) and definition(s) of the array indices
 then answer "yes". If you are in doubt, then answer "yes".

Do you want to establish new dimension(s) for xinput?**y**
 ANSWER=y
 Array xinput is of type 1 or 2:
 1 = vector (1-dim. array), 2 = matrix (2-d array): NDIMEN=**1**
 NDIMEN= 1
 The row index of xinput is called Ixinput .
 PROVIDE A DEFINITION FOR Ixinput . (LESS THAN 60 CHARACTERS!)
vector element number for xinput
 vector element number for xinput
 Maximum allowable number of rows in the array, xinput. NROWS=**21**

NROWS= 21

PROVIDE A DEFINITION FOR xinput. (LESS THAN 60 CHARACTERS!)

x-coordinates for ends of segments

xinput = x-coordinates for ends of segments

DO YOU WANT TO INCLUDE A "HELP" PARAGRAPH? (y or n): **y**

ANSWER=y

PROVIDE HELP PARAGRAPH TO EXPLAIN INPUT

Please make sure to include x=0 and x=a (equator) when

Please make sure to include x = 0 and x = a (equator) when

ANY MORE LINES IN THIS PARAGRAPH? (y or <cr> or n): **y**

ANSWER=y

you provide values for xinput.

you provide values for xinput.

ANY MORE LINES IN THIS PARAGRAPH? (y or <cr> or n): **n**

ANSWER=n

ANY MORE DECISION VARIABLE CANDIDATES (ROLE 1 VARIABLES)

OR FIXED PARAMETERS (e.g. material) (ROLE 2 VARIABLES)? **y**

ANSWER=y

CHOOSE ANOTHER DECISION VARIABLE CANDIDATE (ROLE 1 VARIABLE)

OR FIXED PARAMETER (ROLE 2 VARIABLE).

CHOOSE: 0 or 1:

(0 means "introductory explanatory text")

(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**

TYPE= 1

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS): **ainput**

VNAME=ainput

(lines skipped to save space)

PART 3 of Table a1-b (GENOPT user establishes a Role 3 variable
and a Role 4,5,6 "bundle"))

ANY MORE DECISION VARIABLE CANDIDATES (ROLE 1 VARIABLES)

OR FIXED PARAMETERS (e.g. material) (ROLE 2 VARIABLES)? **n**

ANSWER=n

CHOOSE AN ENVIRONMENTAL PARAMETER (load) (ROLE 3 VARIABLE).

NOTE: There are many optimization problems for which there are no environmental parameters. However, GENOPT is set up with typical engineering problems in mind: some object must be designed to survive one or more environments (loads, temperatures). Therefore, you must include at least one environment here, and at least one response (e.g. stress) to that environment. If environment does not play a real role in your generic problem, just introduce a dummy variable with Role 3. Include a one-line definition and possibly also a "help" paragraph with the dummy variable that lets the end user know how he or she should respond in BEGIN when asked to supply a value for the dummy environment, and that makes it clear in the output that the environment is a dummy variable.

CHOOSE: 0 or 1:
(0 means "introductory explanatory text")
(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**
TYPE= 1

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS):**PRESS**
VNAME=PRESS

IDENTIFY ROLE OF PRESS (1 or 2 or 3 or 4 or 5 or 6 or 7):
1 = decision variable candidate(e.g.length, width, thickness)
2 = fixed parameter (e.g. control integer, material property)
3 = environmental factor (e.g. load, temperature)
4 = response quantity (e.g. stress, buckling load, frequency)
5 = allowable (e.g. maximum stress, minimum frequency)
6 = factor of safety
7 = objective (e.g. minimum weight, minimum cost)

CHOOSE: 1 or 2 or 3 or 4 or 5 or 6 or 7: **3**
IROLEV= 3

PROVIDE A DEFINITION FOR PRESS. (LESS THAN 60 CHARACTERS!)

uniform external pressure

PRESS = uniform external pressure

DO YOU WANT TO INCLUDE A "HELP" PARAGRAPH? (y or n): **n**
ANSWER=n

ANY MORE ENVIRONMENTAL PARAMETERS (loads) (ROLE 3 VARIABLES)? **n**
ANSWER=n

CHOOSE A RESPONSE PARAMETER (e.g. stress) (ROLE 4 VARIABLE).

NOTE: There are many optimization problems for which there are no response parameters. However, GENOPT is set

up with typical engineering problems in mind: some object must be designed to survive one or more environments (loads, temperatures). Therefore, you must include at least one environment (e.g. load) and at least one response (e.g. stress) to that environment. If response does not play a real role in your generic problem, just introduce dummy variables with Role 4 (response), 5 (allowable), and 6 (factor of safety). Include one-line definitions and possibly also "help" paragraphs with the dummy variables that lets the end user know how he or she should respond in BEGIN when asked to supply values for the dummy allowable and the dummy factor of safety corresponding to the dummy response, and that emphasizes in the output that dummy quantities are present. Please read the section in GENOPT.STORY entitled "SOME ITEMS TO BE AWARE OF".

CHOOSE: 0 or 1:

(0 means "introductory explanatory text")

(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**

TYPE= 1

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS):**CLAPS1**

VNAME=CLAPS1

IDENTIFY ROLE OF CLAPS1 (1 or 2 or 3 or 4 or 5 or 6 or 7):

1 = decision variable candidate(e.g.length, width, thickness)

2 = fixed parameter (e.g. control integer, material property)

3 = environmental factor (e.g. load, temperature)

4 = response quantity (e.g. stress, buckling load, frequency)

5 = allowable (e.g. maximum stress, minimum frequency)

6 = factor of safety

7 = objective (e.g. minimum weight, minimum cost)

CHOOSE: 1 or 2 or 3 or 4 or 5 or 6 or 7: **4**

IROLEV= 4

CLAPS1 is an array with the number of rows equal to 20 .

Each row corresponds to a load case.

Do you want to reset the number of columns in CLAPS1?

In this case, if you answer "no" CLAPS1 would be dimensioned CLAPS1(20).

Do you want to reset the number of columns in CLAPS1?**n**

ANSWER=n

PROVIDE A DEFINITION FOR CLAPS1. (LESS THAN 60 CHARACTERS!)

collapse pressure with imperfection mode 1

CLAPS1 = collapse pressure with imperfection mode 1

DO YOU WANT TO INCLUDE A "HELP" PARAGRAPH? (y or n): **n**

ANSWER=n

CHOOSE AN ALLOWABLE FOR CLAPS1 (ROLE 5 VARIABLE).

NOTE: Please read Items 4, 5, and 6 in the section
of GENOPT.STORY entitled "SOME ITEMS TO BE AWARE OF"

CHOOSE: 0 or 1:
(0 means "introductory explanatory text")
(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**

TYPE= 1

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS): **CLAPS1A**

VNAME=CLAPS1A

IDENTIFY ROLE OF CLAPS1A (1 or 2 or 3 or 4 or 5 or 6 or 7):

1 = decision variable candidate(e.g.length, width, thickness)

2 = fixed parameter (e.g. control integer, material property)

3 = environmental factor (e.g. load, temperature)

4 = response quantity (e.g. stress, buckling load, frequency)

5 = allowable (e.g. maximum stress, minimum frequency)

6 = factor of safety

7 = objective (e.g. minimum weight, minimum cost)

CHOOSE: 1 or 2 or 3 or 4 or 5 or 6 or 7: **5**

IROLEV= 5

CLAPS1A is an array with the number of rows equal to 20 .

Each row corresponds to a load case.

PROVIDE A DEFINITION FOR CLAPS1A. (LESS THAN 60 CHARACTERS!)

allowable pressure for axisymmetric collapse

CLAPS1A = allowable pressure for axisymmetric collapse

DO YOU WANT TO INCLUDE A "HELP" PARAGRAPH? (y or n): **n**

ANSWER=n

CHOOSE FACTOR OF SAFETY FOR CLAPS1 (ROLE 6 VARIABLE).

CHOOSE: 0 or 1:
(0 means "introductory explanatory text")
(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**

TYPE= 1

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS): **CLAPS1F**

VNAME=CLAPS1F

IDENTIFY ROLE OF CLAPS1F (1 or 2 or 3 or 4 or 5 or 6 or 7):

1 = decision variable candidate(e.g.length, width, thickness)

2 = fixed parameter (e.g. control integer, material property)

3 = environmental factor (e.g. load, temperature)

4 = response quantity (e.g. stress, buckling load, frequency)

5 = allowable (e.g. maximum stress, minimum frequency)
6 = factor of safety
7 = objective (e.g. minimum weight, minimum cost)

CHOOSE: 1 or 2 or 3 or 4 or 5 or 6 or 7: **6**

IROLEV= 6

CLAPS1F is an array with the number of rows equal to 20 .

Each row corresponds to a load case.

PROVIDE A DEFINITION FOR CLAPS1F. (LESS THAN 60 CHARACTERS!)

factor of safety for axisymmetric collapse

CLAPS1F = factor of safety for axisymmetric collapse

DO YOU WANT TO INCLUDE A "HELP" PARAGRAPH? (y or n): **n**

ANSWER=n

ACTUAL RESPONSE = BEHAV = collapse pressure with imperfection mode 1 =
CLAPS1

ALLOWABLE RESPONSE = ALLOW = allowable pressure for axisymmetric collapse
= CLAPS1A

FACTOR OF SAFETY = FSAFE = factor of safety for axisymmetric collapse =
CLAPS1F

There are three types of behavioral constraint
conditions in an optimization problem:

- 1 For a feasible design the allowable response, ALLOW
must be greater than the product of the actual
response, BEHAV, times its factor of safety, FSAFE.
EXAMPLE: Allowable stress must be greater than the actual
stress x the factor of safety for stress.
For example, a design margin of this type is expressed as:
 $1 - [\text{BEHAVIOR}]/(\text{ALLOWABLE BEHAVIOR}) \times (\text{FACTOR OF SAFETY})$
- 2 For a feasible design the actual response, BEHAV,
must be greater than the product of the allowable
response, ALLOW, times its factor of safety, FSAFE.
EXAMPLES: (a) buckling load factor must be greater than
the allowable value x the factor of safety
for buckling.
(b) lowest natural frequency must be greater
than the allowable value x the factor of
safety for natural frequency.
For example, a design margin of this type is expressed as:
 $[(\text{BEHAVIOR})/(\text{ALLOWABLE BEHAVIOR})] / (\text{FACTOR OF SAFETY}) - 1$
- 3 For a feasible design the allowable response, ALLOW
must be greater than the product of the actual
response, BEHAV, times its factor of safety, FSAFE. (same
as for INDX = 1). However, the margin has a different form

EXAMPLE: Allowable stress must be greater than the actual stress x the factor of safety for stress.

For example, a design margin of this type is expressed as:
[(ALLOWABLE BEHAVIOR)/(BEHAVIOR)] /(FACTOR OF SAFETY) - 1

PLEASE CHOOSE 1 OR 2 OR 3 FOR THIS CONSTRAINT (CLAPS1):**2**
TYPE OF CONSTRAINT= 2
ANY MORE RESPONSE VARIABLES (e.g.buckling) (ROLE 4 VARIABLES)? **y**
ANSWER=y

CHOOSE ANOTHER RESPONSE VARIABLE (ROLE 4 VARIABLE).

CHOOSE: 0 or 1:
(0 means "introductory explanatory text")
(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**
TYPE= 1

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS):**GENBK1**
VNAME=GENBK1

(lines skipped to save space)

ANY MORE RESPONSE VARIABLES (e.g.buckling) (ROLE 4 VARIABLES)? **y**
ANSWER=y

CHOOSE ANOTHER RESPONSE VARIABLE (ROLE 4 VARIABLE).

CHOOSE: 0 or 1:
(0 means "introductory explanatory text")
(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**
TYPE= 1

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS):**SKNBK1**
VNAME=SKNBK1

IDENTIFY ROLE OF SKNBK1 (1 or 2 or 3 or 4 or 5 or 6 or 7):
1 = decision variable candidate(e.g.length, width, thickness)
2 = fixed parameter (e.g. control integer, material property)
3 = environmental factor (e.g. load, temperature)
4 = response quantity (e.g. stress, buckling load, frequency)

5 = allowable (e.g. maximum stress, minimum frequency)
6 = factor of safety
7 = objective (e.g. minimum weight, minimum cost)

CHOOSE: 1 or 2 or 3 or 4 or 5 or 6 or 7: **4**

IROLEV= 4

SKNBK1 is an array with the number of rows equal to 20 .

Each row corresponds to a load case.

Do you want to reset the number of columns in SKNBK1?

In this case, if you answer "no" SKNBK1 would be dimensioned SKNBK1(20).

Do you want to reset the number of columns in SKNBK1?**y**

ANSWER=y

Array SKNBK1 is of type 1 or 2:

1 = vector (1-dim. array), 2 = matrix (2-d array): NDIMEN=**2**

NDIMEN= 2

The column index of SKNBK1 is called JSKNBK1 .

PROVIDE A DEFINITION FOR JSKNBK1. (LESS THAN 60 CHARACTERS!)

number of region for computing behavior

number of regions for computing behavior

Maximum allowable number of columns in the array, SKNBK1. NCOLS=**10**

NCOLS= 10

PROVIDE A DEFINITION FOR SKNBK1. (LESS THAN 60 CHARACTERS!)

local skin buckling load factor, mode 1

SKNBK1 = local skin buckling load factor, mode 1

DO YOU WANT TO INCLUDE A "HELP" PARAGRAPH? (y or n): n

ANSWER=n

CHOOSE AN ALLOWABLE FOR SKNBK1 (ROLE 5 VARIABLE).

CHOOSE: 0 or 1:

(0 means "introductory explanatory text")

(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**

TYPE= 1

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS):**SKNBK1A**

VNAME=SKNBK1A

IDENTIFY ROLE OF SKNBK1A (1 or 2 or 3 or 4 or 5 or 6 or 7):

1 = decision variable candidate(e.g.length, width, thickness)

2 = fixed parameter (e.g. control integer, material property)

3 = environmental factor (e.g. load, temperature)

4 = response quantity (e.g. stress, buckling load, frequency)

5 = allowable (e.g. maximum stress, minimum frequency)

6 = factor of safety

7 = objective (e.g. minimum weight, minimum cost)

CHOOSE: 1 or 2 or 3 or 4 or 5 or 6 or 7: **5**

IROLEV= 5

SKNBK1A is an array with the number of rows equal to 20 .

Each row corresponds to a load case.

PROVIDE A DEFINITION FOR SKNBK1A. (LESS THAN 60 CHARACTERS!)

allowable buckling load factor

SKNBK1A = allowable buckling load factor

DO YOU WANT TO INCLUDE A "HELP" PARAGRAPH? (y or n): **n**

ANSWER=n

CHOOSE FACTOR OF SAFETY FOR SKNBK1 (ROLE 6 VARIABLE).

CHOOSE: 0 or 1:

(0 means "introductory explanatory text")

(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**

TYPE= 1

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS):**SKNBK1F**

VNAME=SKNBK1F

IDENTIFY ROLE OF SKNBK1F (1 or 2 or 3 or 4 or 5 or 6 or 7):

1 = decision variable candidate(e.g.length, width, thickness)

2 = fixed parameter (e.g. control integer, material property)

3 = environmental factor (e.g. load, temperature)

4 = response quantity (e.g. stress, buckling load, frequency)

5 = allowable (e.g. maximum stress, minimum frequency)

6 = factor of safety

7 = objective (e.g. minimum weight, minimum cost)

CHOOSE: 1 or 2 or 3 or 4 or 5 or 6 or 7: **6**

IROLEV= 6

SKNBK1F is an array with the number of rows equal to 20 .

Each row corresponds to a load case.

PROVIDE A DEFINITION FOR SKNBK1F. (LESS THAN 60 CHARACTERS!)

factor of safety for skin buckling

SKNBK1F = factor of safety for skin buckling

DO YOU WANT TO INCLUDE A "HELP" PARAGRAPH? (y or n): **n**

ANSWER=n

ACTUAL RESPONSE = BEHAV = local skin buckling load factor, mode 1 =
SKNBK1

ALLOWABLE RESPONSE = ALLOW = allowable buckling load factor = SKNBK1A

FACTOR OF SAFETY = FSAFE = factor of safety for skin buckling = SKNBK1F

There are three types of behavioral constraint
conditions in an optimization problem:

1 For a feasible design the allowable response, ALLOW must be greater than the product of the actual response, BEHAV, times its factor of safety, FSAFE.
EXAMPLE: Allowable stress must be greater than the actual stress x the factor of safety for stress.
For example, a design margin of this type is expressed as:
 $1 - [\text{BEHAVIOR}]/(\text{ALLOWABLE BEHAVIOR}) \times (\text{FACTOR OF SAFETY})$

2 For a feasible design the actual response, BEHAV, must be greater than the product of the allowable response, ALLOW, times its factor of safety, FSAFE.
EXAMPLES: (a) buckling load factor must be greater than the allowable value x the factor of safety for buckling.
(b) lowest natural frequency must be greater than the allowable value x the factor of safety for natural frequency.
For example, a design margin of this type is expressed as:
 $[(\text{BEHAVIOR})/(\text{ALLOWABLE BEHAVIOR})] / (\text{FACTOR OF SAFETY}) - 1$

3 For a feasible design the allowable response, ALLOW must be greater than the product of the actual response, BEHAV, times its factor of safety, FSAFE. (same as for INDX = 1). However, the margin has a different form
EXAMPLE: Allowable stress must be greater than the actual stress x the factor of safety for stress.
For example, a design margin of this type is expressed as:
 $[(\text{ALLOWABLE BEHAVIOR})/(\text{BEHAVIOR})] / (\text{FACTOR OF SAFETY}) - 1$

PLEASE CHOOSE 1 OR 2 OR 3 FOR THIS CONSTRAINT (SKNBK1):**2**
TYPE OF CONSTRAINT= 2
ANY MORE RESPONSE VARIABLES (e.g.buckling) (ROLE 4 VARIABLES)? **Y**
ANSWER=y

CHOOSE ANOTHER RESPONSE VARIABLE (ROLE 4 VARIABLE).

CHOOSE: 0 or 1:
(0 means "introductory explanatory text")
(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**
TYPE= 1

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS):**STFBK1**
VNAME=STFBK1

IDENTIFY ROLE OF STFBK1 (1 or 2 or 3 or 4 or 5 or 6 or 7):
1 = decision variable candidate(e.g.length, width, thickness)

2 = fixed parameter (e.g. control integer, material property)
3 = environmental factor (e.g. load, temperature)
4 = response quantity (e.g. stress, buckling load, frequency)
5 = allowable (e.g. maximum stress, minimum frequency)
6 = factor of safety
7 = objective (e.g. minimum weight, minimum cost)

CHOOSE: 1 or 2 or 3 or 4 or 5 or 6 or 7: **4**

IROLEV= 4

STFBK1 is an array with the number of rows equal to 20 .

Each row corresponds to a load case.

Do you want to reset the number of columns in STFBK1?

In this case, if you answer "no" STFBK1 would be dimensioned
STFBK1(20,10).

Do you want to reset the number of columns in STFBK1?**n**

ANSWER=n

PROVIDE A DEFINITION FOR STFBK1. (LESS THAN 60 CHARACTERS!)

buckling load factor, isogrid member, mode 1

STFBK1 = buckling load factor, isogrid member, mode 1

DO YOU WANT TO INCLUDE A "HELP" PARAGRAPH? (y or n): **n**

ANSWER=n

CHOOSE AN ALLOWABLE FOR STFBK1 (ROLE 5 VARIABLE).

CHOOSE: 0 or 1:

(0 means "introductory explanatory text")

(1 means "one-line input datum prompt")

CHOOSE: 0 or 1: **1**

TYPE= 1

PROVIDE A NAME FOR THE VARIABLE (7 or less characters, CAPS):**STFBK1A**

VNAME=STFBK1A

=====