

Table A28 List of the file, **equivellipse.SUB.**

This file is similar to the skeletal behavior.new library except that it does not contain a copy of the equivellipse.DEF file (Table a2) and each skeletal subroutine, BEHXi, i = 1, 2, 3... 14, does not yet contain the GENOPT-generated labelled common blocks, equivellipse.COM (Table a6).

=====

C=DECK BEHAVIOR.NEW

C This library contains the skeletons of
C subroutines called SUBROUTINE BEHXn, n = 1,
C 2, 3, . . . that will yield predictions
C of behavioral responses of various systems
C to environments (loads).

C
C You may complete the subroutines by writing
C algorithms that yield the responses,
C each of which plays a part in constraining
C the design to a feasible region. Examples
C of responses are: stress, buckling, drag,
C vibration, deformation, clearances, etc.

C
C A skeleton routine called SUBROUTINE OBJECT
C is also provided for any objective function
C (e.g. weight, deformation, conductivity)
C you may wish to create.

C
C A skeleton routine called SUBROUTINE USRCON
C is also provided for any user-written
C constraint condition you may wish to write:
C This is an INEQUALITY condition that
C involves any program variables. However,
C note that this kind of thing is done
C automatically in the program DECIDE, so
C try DECIDE first to see if your particular
C constraint conditions can be accommodated
C more easily there.

C
C Please note that you do not have to modify
C BEHAVIOR.NEW in any way, but may instead
C prefer to insert your subroutines into the
C skeletal libraries ADDCODEn.NEW, n=1,2,...
C and appropriate common blocks, dimension
C and type statements and calls to these
C subroutines in the library STRUCT.NEW.
C This strategy is best if your FORTRAN
C input to GENOPT contains quite a bit
C of software previously written by

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C   yourself or others, and/or the generation
C   of behavioral constraints is more easily
C   accomplished via another architecture
C   than that provided for in the
C   BEHAVIOR.NEW library. (See instructions
C   in the libraries ADDCODEN.NEW and
C   STRUCT.NEW for this procedure.)
C
C   The two test cases provided with GENOPT
C   provide examples of each method:
C   PLATE (test case 1): use of BEHAVIOR.NEW
C   PANEL (test case 2): use of ADDCODEN.NEW
C                           and STRUCT.NEW.
C
C   SEVEN ROLES THAT VARIABLES IN THIS SYSTEM OF PROGRAMS PLAY
C
C   A variable can have one of the following roles:
C
C   1 = a possible decision variable for optimization,
C       typically a dimension of a structure.
C   2 = a constant parameter (cannot vary as design evolves),
C       typically a control integer or material property,
C       but not a load, allowable, or factor of safety,
C       which are asked for later.
C   3 = a parameter characterizing the environment, such
C       as a load component or a temperature.
C   4 = a quantity that describes the response of the
C       structure, (e.g. stress, buckling load, frequency)
C   5 = an allowable, such as maximum allowable stress,
C       minimum allowable frequency, etc.
C   6 = a factor of safety
C   7 = the quantity that is to be minimized or maximized,
C       called the "objective function" (e.g. weight).
C =====
C
C   NAMES, DEFINITIONS, AND ROLES OF THE VARIABLES:
C
C=DECK      BEHX1
           SUBROUTINE BEHX1
             1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,PHRASE)
C
C   PURPOSE: OBTAIN collapse pressure with imperfection mode 1
C
C   YOU MUST WRITE CODE THAT, USING
C   THE VARIABLES IN THE LABELLED
C   COMMON BLOCKS AS INPUT, ULTIMATELY
C   YIELDS THE RESPONSE VARIABLE FOR
C   THE ith LOAD CASE, ILOADX:

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C
C      CLAPS1(ILOADX)
C
C  AS OUTPUT. THE ith CASE REFERS
C  TO ith ENVIRONMENT (e.g. load com-
C  bination).
C
C  DEFINITIONS OF INPUT DATA:
C    IMODX  = DESIGN CONTROL INTEGER:
C      IMODX = 0 MEANS BASELINE DESIGN
C      IMODX = 1 MEANS PERTURBED DESIGN
C    IFAST  = 0 MEANS FEW  SHORTCUTS FOR PERTURBED DESIGNS
C    IFAST  = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C    IFILE  = FILE FOR OUTPUT LIST:
C    NPRINX= OUTPUT CONTROL INTEGER:
C      NPRINX=0 MEANS SMALLEST AMOUNT
C      NPRINX=1 MEANS MEDIUM AMOUNT
C      NPRINX=2 MEANS LOTS OF OUTPUT
C
C      ILOADX = ith LOADING COMBINATION
C      PHRASE = collapse pressure with imperfection mode 1
C
C  OUTPUT:
C
C      CLAPS1(ILOADX)
C
C      CHARACTER*80 PHRASE
C  INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK      BEHX2
C      SUBROUTINE BEHX2
C        1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,PHRASE)
C
C  PURPOSE: OBTAIN general buckling load factor, mode 1
C
C  YOU MUST WRITE CODE THAT, USING
C  THE VARIABLES IN THE LABELLED
C  COMMON BLOCKS AS INPUT, ULTIMATELY
C  YIELDS THE RESPONSE VARIABLE FOR
C  THE ith LOAD CASE, ILOADX:
C
C      GENBK1(ILOADX)
C
C  AS OUTPUT. THE ith CASE REFERS
C  TO ith ENVIRONMENT (e.g. load com-
C  bination).
C
C  DEFINITIONS OF INPUT DATA:

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```

C      IMODX  = DESIGN CONTROL INTEGER:
C      IMODX = 0 MEANS BASELINE DESIGN
C      IMODX = 1 MEANS PERTURBED DESIGN
C      IFAST = 0 MEANS FEW  SHORTCUTS FOR PERTURBED DESIGNS
C      IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C      IFILE = FILE FOR OUTPUT LIST:
C      NPRINX= OUTPUT CONTROL INTEGER:
C      NPRINX=0 MEANS SMALLEST AMOUNT
C      NPRINX=1 MEANS MEDIUM AMOUNT
C      NPRINX=2 MEANS LOTS OF OUTPUT
C
C      ILOADX = ith LOADING COMBINATION
C      PHRASE = general buckling load factor, mode 1
C
C  OUTPUT:
C
C      GENBK1(ILOADX)
C
C      CHARACTER*80 PHRASE
C  INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK      BEHX3
      SUBROUTINE BEHX3
        1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,JCOL,PHRASE)
C
C  PURPOSE: OBTAIN local skin buckling load factor, mode 1
C
C  YOU MUST WRITE CODE THAT, USING
C  THE VARIABLES IN THE LABELLED
C  COMMON BLOCKS AS INPUT, ULTIMATELY
C  YIELDS THE RESPONSE VARIABLE FOR
C  THE ith LOAD CASE, ILOADX:
C
C      SKNBK1(ILOADX,JCOL)
C
C  AS OUTPUT. THE ith CASE REFERS
C  TO ith ENVIRONMENT (e.g. load com-
C  bination).
C  THE jth COLUMN (JCOL)
C  INDEX IS DEFINED AS FOLLOWS:
C      number of regions for computing behavior
C
C  DEFINITIONS OF INPUT DATA:
C      IMODX  = DESIGN CONTROL INTEGER:
C      IMODX = 0 MEANS BASELINE DESIGN
C      IMODX = 1 MEANS PERTURBED DESIGN
C      IFAST = 0 MEANS FEW  SHORTCUTS FOR PERTURBED DESIGNS
C      IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS

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C   IFILE = FILE FOR OUTPUT LIST:
C   NPRINX= OUTPUT CONTROL INTEGER:
C   NPRINX=0 MEANS SMALLEST AMOUNT
C   NPRINX=1 MEANS MEDIUM AMOUNT
C   NPRINX=2 MEANS LOTS OF OUTPUT
C
C   ILOADX = ith LOADING COMBINATION
C   JCOL   = jth column of SKNBK1
C   JCOL   = number of regions for computing behavior
C   PHRASE = local skin buckling load factor, mode 1
C
C   OUTPUT:
C
C   SKNBK1(ILOADX,JCOL)
C
C   CHARACTER*80 PHRASE
C   INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK      BEHX4
C           SUBROUTINE BEHX4
C             1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,JCOL,PHRASE)
C
C   PURPOSE: OBTAIN buckling load factor, isogrid member, mode 1
C
C   YOU MUST WRITE CODE THAT, USING
C   THE VARIABLES IN THE LABELLED
C   COMMON BLOCKS AS INPUT, ULTIMATELY
C   YIELDS THE RESPONSE VARIABLE FOR
C   THE ith LOAD CASE, ILOADX:
C
C   STFBK1(ILOADX,JCOL)
C
C   AS OUTPUT. THE ith CASE REFERS
C   TO ith ENVIRONMENT (e.g. load com-
C   bination).
C   THE jth COLUMN (JCOL)
C   INDEX IS DEFINED AS FOLLOWS:
C     number of regions for computing behavior
C
C   DEFINITIONS OF INPUT DATA:
C   IMODX = DESIGN CONTROL INTEGER:
C   IMODX = 0 MEANS BASELINE DESIGN
C   IMODX = 1 MEANS PERTURBED DESIGN
C   IFAST = 0 MEANS FEW SHORTCUTS FOR PERTURBED DESIGNS
C   IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C   IFILE = FILE FOR OUTPUT LIST:
C   NPRINX= OUTPUT CONTROL INTEGER:
C   NPRINX=0 MEANS SMALLEST AMOUNT

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C      NPRINX=1 MEANS MEDIUM AMOUNT
C      NPRINX=2 MEANS LOTS OF OUTPUT
C
C      ILOADX = ith LOADING COMBINATION
C      JCOL   = jth column of STFBK1
C      JCOL   = number of regions for computing behavior
C      PHRASE = buckling load factor, isogrid member, mode 1
C
C      OUTPUT:
C
C      STFBK1(ILOADX,JCOL)
C
C      CHARACTER*80 PHRASE
C      INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK          BEHX5
C      SUBROUTINE BEHX5
C      1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,JCOL,PHRASE)
C
C      PURPOSE: OBTAIN maximum stress in the shell skin, mode 1
C
C      YOU MUST WRITE CODE THAT, USING
C      THE VARIABLES IN THE LABELLED
C      COMMON BLOCKS AS INPUT, ULTIMATELY
C      YIELDS THE RESPONSE VARIABLE FOR
C      THE ith LOAD CASE, ILOADX:
C
C      SKNST1(ILOADX,JCOL)
C
C      AS OUTPUT. THE ith CASE REFERS
C      TO ith ENVIRONMENT (e.g. load com-
C      bination).
C      THE jth COLUMN (JCOL)
C      INDEX IS DEFINED AS FOLLOWS:
C      number of regions for computing behavior
C
C      DEFINITIONS OF INPUT DATA:
C      IMODX = DESIGN CONTROL INTEGER:
C      IMODX = 0 MEANS BASELINE DESIGN
C      IMODX = 1 MEANS PERTURBED DESIGN
C      IFAST = 0 MEANS FEW SHORTCUTS FOR PERTURBED DESIGNS
C      IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C      IFILE = FILE FOR OUTPUT LIST:
C      NPRINX= OUTPUT CONTROL INTEGER:
C      NPRINX=0 MEANS SMALLEST AMOUNT
C      NPRINX=1 MEANS MEDIUM AMOUNT
C      NPRINX=2 MEANS LOTS OF OUTPUT
C

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C      ILOADX = ith LOADING COMBINATION
C      JCOL   = jth column of SKNST1
C      JCOL   = number of regions for computing behavior
C      PHRASE = maximum stress in the shell skin, mode 1
C
C  OUTPUT:
C
C      SKNST1(ILOADX,JCOL)
C
C      CHARACTER*80 PHRASE
C  INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK      BEHX6
C      SUBROUTINE BEHX6
C      1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,JCOL,PHRASE)
C
C  PURPOSE: OBTAIN maximum stress in isogrid stiffener, mode 1
C
C  YOU MUST WRITE CODE THAT, USING
C  THE VARIABLES IN THE LABELLED
C  COMMON BLOCKS AS INPUT, ULTIMATELY
C  YIELDS THE RESPONSE VARIABLE FOR
C  THE ith LOAD CASE, ILOADX:
C
C      STFST1(ILOADX,JCOL)
C
C  AS OUTPUT. THE ith CASE REFERS
C  TO ith ENVIRONMENT (e.g. load com-
C  bination).
C  THE jth COLUMN (JCOL)
C  INDEX IS DEFINED AS FOLLOWS:
C      number of regions for computing behavior
C
C  DEFINITIONS OF INPUT DATA:
C      IMODX = DESIGN CONTROL INTEGER:
C      IMODX = 0 MEANS BASELINE DESIGN
C      IMODX = 1 MEANS PERTURBED DESIGN
C      IFAST = 0 MEANS FEW SHORTCUTS FOR PERTURBED DESIGNS
C      IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C      IFILE = FILE FOR OUTPUT LIST:
C      NPRINX= OUTPUT CONTROL INTEGER:
C      NPRINX=0 MEANS SMALLEST AMOUNT
C      NPRINX=1 MEANS MEDIUM AMOUNT
C      NPRINX=2 MEANS LOTS OF OUTPUT
C
C      ILOADX = ith LOADING COMBINATION
C      JCOL   = jth column of STFST1
C      JCOL   = number of regions for computing behavior

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C      PHRASE = maximum stress in isogrid stiffener, mode 1
C
C      OUTPUT:
C
C      STFST1(ILOADX,JCOL)
C
C      CHARACTER*80 PHRASE
C      INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK      BEHX7
      SUBROUTINE BEHX7
        1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,PHRASE)
C
C      PURPOSE: OBTAIN normal (axial) displacement at apex, mode 1
C
C      YOU MUST WRITE CODE THAT, USING
C      THE VARIABLES IN THE LABELLED
C      COMMON BLOCKS AS INPUT, ULTIMATELY
C      YIELDS THE RESPONSE VARIABLE FOR
C      THE ith LOAD CASE, ILOADX:
C
C      WAPEX1(ILOADX)
C
C      AS OUTPUT. THE ith CASE REFERS
C      TO ith ENVIRONMENT (e.g. load com-
C      bination).
C
C      DEFINITIONS OF INPUT DATA:
C      IMODX = DESIGN CONTROL INTEGER:
C      IMODX = 0 MEANS BASELINE DESIGN
C      IMODX = 1 MEANS PERTURBED DESIGN
C      IFAST = 0 MEANS FEW SHORTCUTS FOR PERTURBED DESIGNS
C      IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C      IFILE = FILE FOR OUTPUT LIST:
C      NPRINX= OUTPUT CONTROL INTEGER:
C      NPRINX=0 MEANS SMALLEST AMOUNT
C      NPRINX=1 MEANS MEDIUM AMOUNT
C      NPRINX=2 MEANS LOTS OF OUTPUT
C
C      ILOADX = ith LOADING COMBINATION
C      PHRASE = normal (axial) displacement at apex, mode 1
C
C      OUTPUT:
C
C      WAPEX1(ILOADX)
C
C      CHARACTER*80 PHRASE
C      INSERT ADDITIONAL COMMON BLOCKS:

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C
C=DECK      BEHX8
      SUBROUTINE BEHX8
        1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,PHRASE)
C
C  PURPOSE: OBTAIN collapse pressure with imperfection mode 2
C
C  YOU MUST WRITE CODE THAT, USING
C  THE VARIABLES IN THE LABELLED
C  COMMON BLOCKS AS INPUT, ULTIMATELY
C  YIELDS THE RESPONSE VARIABLE FOR
C  THE ith LOAD CASE, ILOADX:
C
C      CLAPS2(ILOADX)
C
C  AS OUTPUT. THE ith CASE REFERS
C  TO ith ENVIRONMENT (e.g. load com-
C  bination).
C
C  DEFINITIONS OF INPUT DATA:
C    IMODX = DESIGN CONTROL INTEGER:
C      IMODX = 0 MEANS BASELINE DESIGN
C      IMODX = 1 MEANS PERTURBED DESIGN
C    IFAST = 0 MEANS FEW SHORTCUTS FOR PERTURBED DESIGNS
C    IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C    IFILE = FILE FOR OUTPUT LIST:
C    NPRINX= OUTPUT CONTROL INTEGER:
C      NPRINX=0 MEANS SMALLEST AMOUNT
C      NPRINX=1 MEANS MEDIUM AMOUNT
C      NPRINX=2 MEANS LOTS OF OUTPUT
C
C      ILOADX = ith LOADING COMBINATION
C      PHRASE = collapse pressure with imperfection mode 2
C
C  OUTPUT:
C
C      CLAPS2(ILOADX)
C
C      CHARACTER*80 PHRASE
C  INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK      BEHX9
      SUBROUTINE BEHX9
        1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,PHRASE)
C
C  PURPOSE: OBTAIN general buckling load factor, mode 2
C
C  YOU MUST WRITE CODE THAT, USING

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C   THE VARIABLES IN THE LABELLED
C   COMMON BLOCKS AS INPUT, ULTIMATELY
C   YIELDS THE RESPONSE VARIABLE FOR
C   THE ith LOAD CASE, ILOADX:
C
C       GENBK2(ILOADX)
C
C   AS OUTPUT. THE ith CASE REFERS
C   TO ith ENVIRONMENT (e.g. load com-
C   bination).
C
C   DEFINITIONS OF INPUT DATA:
C   IMODX = DESIGN CONTROL INTEGER:
C   IMODX = 0 MEANS BASELINE DESIGN
C   IMODX = 1 MEANS PERTURBED DESIGN
C   IFAST = 0 MEANS FEW SHORTCUTS FOR PERTURBED DESIGNS
C   IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C   IFILE = FILE FOR OUTPUT LIST:
C   NPRINX= OUTPUT CONTROL INTEGER:
C   NPRINX=0 MEANS SMALLEST AMOUNT
C   NPRINX=1 MEANS MEDIUM AMOUNT
C   NPRINX=2 MEANS LOTS OF OUTPUT
C
C   ILOADX = ith LOADING COMBINATION
C   PHRASE = general buckling load factor, mode 2
C
C   OUTPUT:
C
C       GENBK2(ILOADX)
C
C       CHARACTER*80 PHRASE
C   INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK          BEHX10
               SUBROUTINE BEHX10
               1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,JCOL,PHRASE)
C
C   PURPOSE: OBTAIN local skin buckling load factor, mode 2
C
C   YOU MUST WRITE CODE THAT, USING
C   THE VARIABLES IN THE LABELLED
C   COMMON BLOCKS AS INPUT, ULTIMATELY
C   YIELDS THE RESPONSE VARIABLE FOR
C   THE ith LOAD CASE, ILOADX:
C
C       SKNBK2(ILOADX,JCOL)
C
C   AS OUTPUT. THE ith CASE REFERS

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```

C   TO ith ENVIRONMENT (e.g. load com-
C   bination).
C   THE jth COLUMN (JCOL)
C   INDEX IS DEFINED AS FOLLOWS:
C       number of regions for computing behavior
C
C   DEFINITIONS OF INPUT DATA:
C       IMODX = DESIGN CONTROL INTEGER:
C           IMODX = 0 MEANS BASELINE DESIGN
C           IMODX = 1 MEANS PERTURBED DESIGN
C       IFAST = 0 MEANS FEW SHORTCUTS FOR PERTURBED DESIGNS
C       IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C       IFILE = FILE FOR OUTPUT LIST:
C       NPRINX= OUTPUT CONTROL INTEGER:
C           NPRINX=0 MEANS SMALLEST AMOUNT
C           NPRINX=1 MEANS MEDIUM AMOUNT
C           NPRINX=2 MEANS LOTS OF OUTPUT
C
C       ILOADX = ith LOADING COMBINATION
C       JCOL   = jth column of SKNBK2
C       JCOL   = number of regions for computing behavior
C       PHRASE = local skin buckling load factor, mode 2
C
C   OUTPUT:
C
C       SKNBK2(ILOADX,JCOL)
C
C       CHARACTER*80 PHRASE
C   INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK      BEHX11
           SUBROUTINE BEHX11
             1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,JCOL,PHRASE)
C
C   PURPOSE: OBTAIN buckling load factor for isogrid member, mode 2
C
C   YOU MUST WRITE CODE THAT, USING
C   THE VARIABLES IN THE LABELLED
C   COMMON BLOCKS AS INPUT, ULTIMATELY
C   YIELDS THE RESPONSE VARIABLE FOR
C   THE ith LOAD CASE, ILOADX:
C
C       STFBK2(ILOADX,JCOL)
C
C   AS OUTPUT. THE ith CASE REFERS
C   TO ith ENVIRONMENT (e.g. load com-
C   bination).
C   THE jth COLUMN (JCOL)

```

```

C   INDEX IS DEFINED AS FOLLOWS:
C       number of regions for computing behavior
C
C   DEFINITIONS OF INPUT DATA:
C       IMODX  = DESIGN CONTROL INTEGER:
C           IMODX = 0 MEANS BASELINE DESIGN
C           IMODX = 1 MEANS PERTURBED DESIGN
C       IFAST  = 0 MEANS FEW  SHORTCUTS FOR PERTURBED DESIGNS
C       IFAST  = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C       IFILE  = FILE FOR OUTPUT LIST:
C       NPRINX= OUTPUT CONTROL INTEGER:
C           NPRINX=0 MEANS SMALLEST AMOUNT
C           NPRINX=1 MEANS MEDIUM AMOUNT
C           NPRINX=2 MEANS LOTS OF OUTPUT
C
C       ILOADX = ith LOADING COMBINATION
C       JCOL   = jth column of STFBK2
C       JCOL   = number of regions for computing behavior
C       PHRASE = buckling load factor for isogrid member, mode 2
C
C   OUTPUT:
C
C       STFBK2(ILOADX,JCOL)
C
C           CHARACTER*80 PHRASE
C   INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK          BEHX12
C           SUBROUTINE BEHX12
C               1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,JCOL,PHRASE)
C
C   PURPOSE: OBTAIN maximum stress in the shell skin, mode 2
C
C   YOU MUST WRITE CODE THAT, USING
C   THE VARIABLES IN THE LABELLED
C   COMMON BLOCKS AS INPUT, ULTIMATELY
C   YIELDS THE RESPONSE VARIABLE FOR
C   THE ith LOAD CASE, ILOADX:
C
C       SKNST2(ILOADX,JCOL)
C
C   AS OUTPUT. THE ith CASE REFERS
C   TO ith ENVIRONMENT (e.g. load com-
C   bination).
C   THE jth COLUMN (JCOL)
C   INDEX IS DEFINED AS FOLLOWS:
C       number of regions for computing behavior
C

```

```

C   DEFINITIONS OF INPUT DATA:
C   IMODX  = DESIGN CONTROL INTEGER:
C   IMODX = 0 MEANS BASELINE DESIGN
C   IMODX = 1 MEANS PERTURBED DESIGN
C   IFAST  = 0 MEANS FEW  SHORTCUTS FOR PERTURBED DESIGNS
C   IFAST  = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C   IFILE  = FILE FOR OUTPUT LIST:
C   NPRINX= OUTPUT CONTROL INTEGER:
C   NPRINX=0 MEANS SMALLEST AMOUNT
C   NPRINX=1 MEANS MEDIUM AMOUNT
C   NPRINX=2 MEANS LOTS OF OUTPUT
C
C   ILOADX = ith LOADING COMBINATION
C   JCOL   = jth column of SKNST2
C   JCOL   = number of regions for computing behavior
C   PHRASE = maximum stress in the shell skin, mode 2
C
C   OUTPUT:
C
C   SKNST2(ILOADX,JCOL)
C
C   CHARACTER*80 PHRASE
C   INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK          BEHX13
               SUBROUTINE BEHX13
                 1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,JCOL,PHRASE)
C
C   PURPOSE: OBTAIN maximum stress in isogrid stiffener, mode 2
C
C   YOU MUST WRITE CODE THAT, USING
C   THE VARIABLES IN THE LABELLED
C   COMMON BLOCKS AS INPUT, ULTIMATELY
C   YIELDS THE RESPONSE VARIABLE FOR
C   THE ith LOAD CASE, ILOADX:
C
C   STFST2(ILOADX,JCOL)
C
C   AS OUTPUT. THE ith CASE REFERS
C   TO ith ENVIRONMENT (e.g. load com-
C   bination).
C   THE jth COLUMN (JCOL)
C   INDEX IS DEFINED AS FOLLOWS:
C   number of regions for computing behavior
C
C   DEFINITIONS OF INPUT DATA:
C   IMODX  = DESIGN CONTROL INTEGER:
C   IMODX = 0 MEANS BASELINE DESIGN

```

```

C      IMODX = 1 MEANS PERTURBED DESIGN
C      IFAST = 0 MEANS FEW  SHORTCUTS FOR PERTURBED DESIGNS
C      IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C      IFILE = FILE FOR OUTPUT LIST:
C      NPRINX= OUTPUT CONTROL INTEGER:
C      NPRINX=0 MEANS SMALLEST AMOUNT
C      NPRINX=1 MEANS MEDIUM AMOUNT
C      NPRINX=2 MEANS LOTS OF OUTPUT
C
C      ILOADX = ith LOADING COMBINATION
C      JCOL   = jth column of STFST2
C      JCOL   = number of regions for computing behavior
C      PHRASE = maximum stress in isogrid stiffener, mode 2
C
C      OUTPUT:
C
C      STFST2(ILOADX,JCOL)
C
C      CHARACTER*80 PHRASE
C      INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK      BEHX14
           SUBROUTINE BEHX14
             1 (IFILE,NPRINX,IMODX,IFAST,ILOADX,PHRASE)
C
C      PURPOSE: OBTAIN normal (axial) displacement at apex, mode 2
C
C      YOU MUST WRITE CODE THAT, USING
C      THE VARIABLES IN THE LABELLED
C      COMMON BLOCKS AS INPUT, ULTIMATELY
C      YIELDS THE RESPONSE VARIABLE FOR
C      THE ith LOAD CASE, ILOADX:
C
C      WAPEX2(ILOADX)
C
C      AS OUTPUT. THE ith CASE REFERS
C      TO ith ENVIRONMENT (e.g. load com-
C      bination).
C
C      DEFINITIONS OF INPUT DATA:
C      IMODX = DESIGN CONTROL INTEGER:
C      IMODX = 0 MEANS BASELINE DESIGN
C      IMODX = 1 MEANS PERTURBED DESIGN
C      IFAST = 0 MEANS FEW  SHORTCUTS FOR PERTURBED DESIGNS
C      IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C      IFILE = FILE FOR OUTPUT LIST:
C      NPRINX= OUTPUT CONTROL INTEGER:
C      NPRINX=0 MEANS SMALLEST AMOUNT

```

```

C      NPRINX=1 MEANS MEDIUM AMOUNT
C      NPRINX=2 MEANS LOTS OF OUTPUT
C
C      ILOADX = ith LOADING COMBINATION
C      PHRASE = normal (axial) displacement at apex, mode 2
C
C      OUTPUT:
C
C      WAPEX2(ILOADX)
C
C      CHARACTER*80 PHRASE
C      INSERT ADDITIONAL COMMON BLOCKS:
C
C=DECK      USRCON
C      SUBROUTINE USRCON(INUMTT,IMODX,CONMAX,ICONSX,IPOINC,CONSTX,
C      1  WORDCX,WORDMX,PCWORD,CPLOTX,ICARX,IFILEX)
C      PURPOSE: GENERATE USER-WRITTEN
C      INEQUALITY CONSTRAINT CONDITION
C      USING ANY COMBINATION OF PROGRAM
C      VARIABLES.
C      YOU MUST WRITE CODE THAT, USING
C      THE VARIABLES IN THE LABELLED
C      COMMON BLOCKS AS INPUT, ULTIMATELY
C      YIELDS A CONSTRAINT CONDITION,
C      CALLED "CONX" IN THIS ROUTINE.
C      DIMENSION WORDCX(*),WORDMX(*),IPOINC(*),CONSTX(*)
C      DIMENSION PCWORD(*),CPLOTX(*)
C      CHARACTER*80 WORDCX,WORDMX,PCWORD
C      INSERT ADDITIONAL COMMON BLOCKS:
C
C      CONX = 0.0
C
C      INSERT USER-WRITTEN STATEMENTS
C      HERE. THE CONSTRAINT CONDITION
C      THAT YOU CALCULATE IS CALLED "CONX"
C
C      IF (CONX.EQ.0.0) RETURN
C      IF (CONX.LT.0.0) THEN
C          WRITE(IFILEX,*) ' CONX MUST BE GREATER THAN ZERO.'
C          CALL EXIT
C      ENDIF
C
C      DO NOT CHANGE THE FOLLOWING STATEMENTS, EXCEPT WORDC
C
C      ICARX = ICARX + 1
C      INUMTT = INUMTT + 1
C      WORDCX(ICARX) = ' USER: PROVIDE THIS.'
C      CPLOTX(ICARX) = CONX - 1.

```

```

        CALL BLANKX(WORDCX(ICARX),IENDP)
        PCWORD(ICARX) = WORDCX(ICARX)(1:IENDP)//' -1'
        IF (IMODX.EQ.0.AND.CONX.GT.CONMAX) GO TO 200
        IF (IMODX.EQ.1.AND.IPOINC(INUMTT).EQ.0) GO TO 200
        ICONSX = ICONSX + 1
        IF (IMODX.EQ.0) IPOINC(INUMTT) = 1
        CONSTX(ICONSX) = CONX
        WORDMX(ICONSX) = WORDCX(ICARX)(1:IENDP)//' -1'
200 CONTINUE
C   END OF USRCON
C=DECK      USRLNK
        SUBROUTINE USRLNK(VARI,I,VARIAB)
C Purpose: generate user-written
C linking conditions using any
C combination of decision variables.
C You must write code that, using
C the variables in the subroutine
C argument VARIAB as input, ultimately
C yield a value for the linked variable
C VARI.
C
C VARI is the Ith entry of the array
C VARIAB. You have decided that this
C is to be a linked variable with user
C defined linking. It is linked to
C the decision variables in the array
C VARIAB.
C An example will provide the simplest
C explanation of this:
C Let's say that the 5th decision
C variable candidate (I=5) is linked
C to the decision variable candidates
C 2 and 7. (You used DECIDE to select
C these as decision variables.
C In this case VARI is equal to
C VARIAB(I). You then write your
C linking equation in the form
C VARI=f(VARIAB(2),VARIAB(7)).
C Use the index I in an IF statement if
C you have more than one user-defined
C linked variable.
C
C
        REAL VARI,VARIAB(50)
        INTEGER I
C
C   INSERT USER-WRITTEN DECLARATION
C   STATEMENTS HERE.

```



```

C
C  INSERT USER-WRITTEN
C  STATEMENTS HERE.
C
C
C  END OF USRLNK
      RETURN
      END
C=DECK      OBJECT
      SUBROUTINE OBJECT(IFILE,NPRINX,IMODX,OBJGEN,PHRASE)
C  PURPOSE:weight of the equivalent ellipsoidal head
C
C  YOU MUST WRITE CODE THAT, USING
C  THE VARIABLES IN THE LABELLED
C  COMMON BLOCKS AS INPUT, ULTIMATELY
C  YIELDS THE OBJECTIVE FUNCTION
C      WEIGHT
C  AS OUTPUT. MAKE SURE TO INCLUDE AT
C  THE END OF THE SUBROUTINE, THE
C  STATEMENT: OBJGEN = WEIGHT
C
C
C  DEFINITIONS OF INPUT DATA:
C  IMODX  = DESIGN CONTROL INTEGER:
C  IMODX = 0 MEANS BASELINE DESIGN
C  IMODX = 1 MEANS PERTURBED DESIGN
C  IFAST = 0 MEANS FEW  SHORTCUTS FOR PERTURBED DESIGNS
C  IFAST = 1 MEANS MORE SHORTCUTS FOR PERTURBED DESIGNS
C  IFILE = FILE FOR OUTPUT LIST:
C  NPRINX= OUTPUT CONTROL INTEGER:
C  NPRINX=0 MEANS SMALLEST AMOUNT
C  NPRINX=1 MEANS MEDIUM AMOUNT
C  NPRINX=2 MEANS LOTS OF OUTPUT
C
C  DEFINITION OF PHRASE:
C  PHRASE = weight of the equivalent ellipsoidal head
C
C      CHARACTER*80 PHRASE
C  INSERT ADDITIONAL COMMON BLOCKS:
=====

```