Operator CALC_FLUI_STRU

1 Goal

To calculate the modal parameters of a structure subjected to a flow. Allows to take account of the forces fluid-rubber bands which are represented by a matrix of transfer complexes connecting them to modal displacements. For certain configurations, the matrix of transfer can be broken up into three real matrices of coefficients of mass, damping and rigidity added.

The disturbances of the modal characteristics of the structure depend on the rate of the flow. Thus the terms of the matrix of transfer of the efforts fluid-rubber bands depend on the speed of the fluid and the frequency of the movement by the biai of the parameter fallback speed $V_R = V (f.D)$.

The operator calculates a modal base modified by the coupling, for each mean velocity of the fluid studied. The produced concept is of type `melasflu`.

2 Syntax

```
melf   [melasflu] = CALC_FLUI_STRU   (

   ◊  VITE_FLUI        =   _F (
                           ◊  VITE_MIN            =  VI,       [R]
                           ◊  VITE_MAX            =  VM,       [R]
                           ◊  NB_POIN             =  Np,       [I]
                           ),
   ♦  BASE_MODALE      =   _F (
                           ♦  MODE_MECA           =  mode,     [mode_meca]
                           ◊  NUME_ORDRE          =  l_nuor,   [l_I]
                           ◊  /   AMOR_REDUIT     =  l_amor,   [l_R]
                              /   AMOR_UNIF       =  amor,     [R]
                           ◊      AMOR_REDUIT_CONN =  l_amor_c, [l_R]

                           ),
   ♦  TYPE_FLUI_STRU   =   typeflui,                           [type_flui_stru]
   ◊  IMPRESSION       =   _F (
                           ◊  PARA_COUPLAGE       =  / 'YES'   [DEFECT]
                                                     / 'NOT',
                           ◊  DEFORMATION            =  / 'NOT'   [DEFECT]
                                                     / 'YES',
                              ),
   ◊  STOP_ERREUR      =   / 'YES'   [DEFECT]
                           / 'NOT',
                  );
```

3 Operands

3.1 Keyword VITE_FLUI

◊ VITE_FLUI

Keyword factor which makes it possible to define the beach studied fluid speeds and discretization.

◊ VITE_MIN = VI

First value the speed for which the parameters of coupling are calculated.

◊ VITE_MAX = VM

Last value the speed for which the parameters of coupling are calculated.

◊ NB_POIN = Np

The number of points defines of speed (the step of discretization is constant).

3.2 Keyword BASE_MODALE

♦ BASE_MODALE

Keyword factor which makes it possible to define the modal base of concept mode_meca for which the parameters of coupling are calculated. The coupling modifies the Eigen frequencies and the values of the terms of damping reduces associated with each mode (keyword AMOR_REDUIT or AMOR_UNIF).

♦ MODE_MECA = mode

Base modal of type of concept mode_meca.

◊ NUME_ORDRE = l_nuor

Allows to select the modes of the modal base of type mode_meca to take into account for the calculation of the coupling.

◊ / AMOR_REDUIT = l_amor

List of reduced depreciation (percentage of damping criticizes) correspondent with each mode of the structure.

Note:

They must be of number identical to the number of modes taken into account (these modes are defined by the keyword NUME_ORDRE).

/ AMOR_UNIF = amor

One applies to all the modes of the modal base same reduced damping.

◊ AMOR_REDUIT_CONN = l_amor_c

List of reduced depreciation (percentage of damping criticizes) correspondent with each mode of the structure for the method of Connors (see [R4.07.04]). In accordance with this reference material, one provides two values of report of instability of Connors (including one known as “All components”).

Note:

As for the keyword AMOR_REDUIT, they must be of number identical to the number of modes taken into account.

3.3 Keyword TYPE_FLUI_STRU

♦ TYPE_FLUI_STRU = typeflui

Concept of the type type_flui_stru. It makes it possible to define the studied configuration, i.e. the coefficients of coupling used for the modeling of the forces fluid-rubber bands.

Note:

In the case of a configuration of standard "the tube bundle under axial flow" (keyword factor FAISCEAU_AXIAL), the calculation of the parameters of coupling of the structure with the fluid in at-rest state, is taken into account. This calculation is carried out whatever the beach fluid speeds that the user informed by the keyword VITE_FLUI .
In this case of a fluid at rest, the matrix of transfer representing the fluid force - elastic exerted on the structure, is put in the shape of a matrix of added damping.

3.4 Keyword IMPRESSION

◊ IMPRESSION

Keyword factor allowing the user to choose information which it wishes to make write in the file RESULT.

◊ PARA_COUPLAGE = 'YES' or 'NOT'

By this keyword, the user can ask for the impression of tables of results giving for each mode the evolutions fallback speed, frequency and modal reduced damping according to the rate of flow of the fluid. The value by default is 'YES'.

◊ DEFORMATION = 'YES' or 'NOT'

By this keyword the user can request the impression from the format 'RESULT' fields of displacements corresponding to the modal deformations. The value by default is 'NOT'.

3.5 Operand STOP_ERREUR

◊ STOP_ERREUR = stop

Keyword which makes it possible to define the behavior of the code in the event of problem of convergence in the calculation of the coefficients of coupling for a given speed and a mode of structural deformation.

If STOP_ERREUR=' OUI', the code stops in fatal error in the event of problem of convergence by notifying the user speed concerned.

If STOP_ERREUR=' NON', the code emits an alarm notifying the user of the problem of convergence (speed and number of mode) and stores the last computed value for the coefficients of coupling.

4 Remarks

In the case of a configuration of the type "tube bundles under transverse flow", it is possible to define several zones of interaction between the fluid and the structure, each one of these zones being able to be modelled independently others. The calculation of the modal parameters of the structure subjected to a flow then takes account of each one of these zones, defined explicitly in the order DEFI_FLUI_STRU [U4.25.01].

The concept produced by CALC_FLUI_STRU contains, in the form of table, the matrices of mass, damping and rigidity for each speed of fluid. The table, representing the modified modal base, can be recovered by RECU_TABLE in order to be injected into a calculation DYNA_TRAN_MODAL. This sequence of calculation is put in work in the case test SDLL118A.