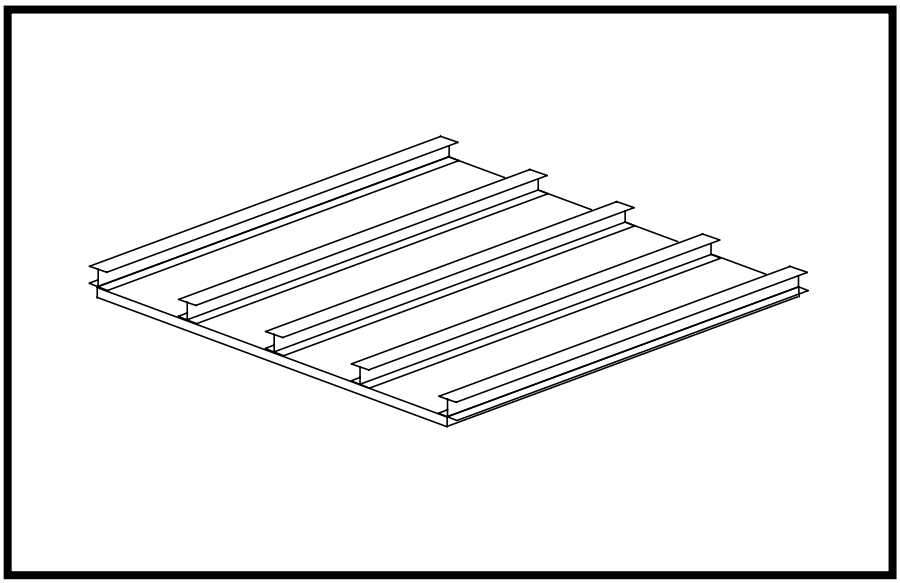
APPENDIX C

Normal Modes Analysis of a Simply-Supported Stiffened Plate



Objectives:

- Manually convert a Linear Static analysis (Sol 101) input file to a Normal Modes analysis (Sol 103) input file.
- Learn how to generate weight information for your model.
- Submit a Normal Modes analysis to MSC/NASTRAN.
- Import both model AND results into MSC/PATRAN via the MSC/NASTRAN binary results file (.op2).
- Review the results of a Normal Modes analysis.
- Visualize modal shapes.

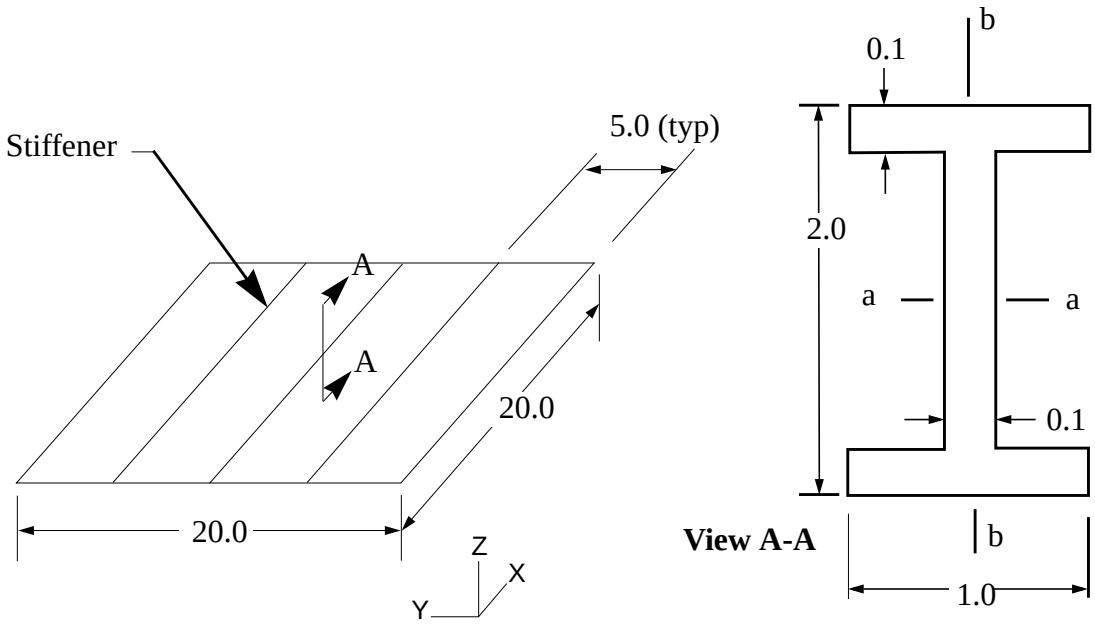
Stiffened Plate (Sol 103)

Objectives:

- Use MSC/PATRAN to convert a Linear Static analysis (Sol 101) input file to a Normal Modes analysis (Sol 103) input file.
- Learn how to generate weight information for your model.
- Submit a Normal Modes analysis to MSC/NASTRAN.
- Import both model AND results into MSC/PATRAN via the MSC/NASTRAN binary results file (.op2).
- Review the results of a Normal Modes analysis.
- Visualize modal shapes.

Model Description:

The model used for this exercise is identical to the model used for Lesson 8.



Elastic Modulus:	10.3E6 psi
Poisson Ratio:	0.3
Density:	0.101 lbs/in^3
Plate Thickness:	0.1 in
Bar cross sectional area:	0.38 in^2
Iaa:	0.2293 in^4
Ibb:	0.0168 in^4
J:	0.0013 in^4

Exercise Procedure:

1. The input file you will be working with is called nas120ex11_work.bdf. This input file is identical to solution input file for Exercise 8. Your task is to edit this file so that the MSC/NASTRAN solver will extract the **first five** normal modes.

2. Input file items that you will need to consider:

Entry	Comments
FMS	
SOL	What solution sequence should we be using for a Normal Modes analysis?
Case Control	
LOAD	What is the significance of an externally applied load with respect to an eigenvalue problem?
METHOD	How does the solver know what eigenvalue extraction parameters to use?
SPCFORCES, STRESS	What is the significance of the force & stress results with respect to an eigenvalue problem?
Bulk Data (PARAMs)	
COUPMASS	Which mass matrix formulation should be used? Lumped or consistent?
GRDPNT	What useful information can result from this entry?
EIGRL	How does this entry relate to a Normal Modes analysis?

3. Create a new database named **nas120ex11.db**.

File/New...

New Database Name: **lesson11**

OK

In the New Model Preferences form set the following:

Tolerance: ◆ **Default**

Analysis Code: **MSC/NASTRAN**

Analysis Type: **Structural**

OK

4. Import the existing linear static model into MSC/PATRAN. To do this, go to the Analysis form and proceed as follows:

◆ **Analysis**

Action: **Read Input File**

Object: **Model Data**

Method: **Translate**

Select Input File...

Filter

Selected Input File: **???** *(Select the desired **.bdf** file)*

OK

Apply

When the translation is complete and the Heartbeat turns green, review the NASTRAN Input File Import Summary and reject cards to ensure that no necessary entries are omitted.

OK

5. Now use MSC/PATRAN to convert the linear static input file to a normal modes input file.

◆ **Analysis**

Action: **Analyze**

Object: **Entire Model**

Method: **Analysis Deck**

Job Name: **lesson11_mode**

Translation Parameters...

OUTPUT2 Format: **Binary**

MSC/NASTRAN Version: **???** Set accordingly, here it is **70**

OK

Solution Type...

Solution Type: ◆ **Normal Modes**

Solution Parameters...

■ **Database Run**

■ **Automatic Constraints**

Mass Calculation: **Coupled**

Data Deck Echo: **Sorted**

Wt.- Mass Conversion = **0.00259** *(For English units)*

Node ID for Wt. Gener. = **0**

OK

OK

Subcase Create...

Available Subcases: **LOAD_STATIC.SCI**

Subcase Parameters...

Number of desired roots: **5**

OK

Apply

Cancel

Subcase Select...

Subcase Selected: **Default** *(Click to deselect)*

Subcase for solution sequence: **LOAD_STATIC.SCI**

OK

Finally, click on

Apply

to create the input file.

6. After you complete your revisions, submit the input file to the MSC/NASTRAN solver for analysis. To do this, find an available xterm window and at the prompt enter:

nastran nas120ex11_mode.bdf scr=yes

Monitor the run using the UNIX **ps** command.

7. When the run is completed, edit the **nas120ex11_mode.f06** file and search for the word **FATAL**. If none exists, search for the word **WARNING**. Determine whether or not existing WARNING messages indicate modeling errors.

8. While still editing **nas120ex11_mode.f06**, search for the word:

W E I G H T (spaces are necessary)

What is the weight of our structure?

weight = _____

Where is the Center of the Gravity (C.G.) located?

X-C.G. = _____

Y-C.G. = _____

Z-C.G. = _____

Search for the word:

R E A L (spaces are necessary).

What are the first 5 modal frequencies for our structure?

mode 1 _____ **Hz**

mode 2 _____ **Hz**

mode 3 _____ **Hz**

mode 4 _____ **Hz**

mode 5 _____ **Hz**