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NX I-deas Response Analysis

Predicting dynamic responses in structural models

fact sheet

Siemens PLM Software www.siemens.com/plm

Summary

NX® I-deas® Response Analysis software is an add-on module within NX I-deas that predicts the dynamic responses of structural models under various loading conditions. Augmenting the capabilities of NX I-deas MasterFEM, Response Analysis produces a broad range of XY graphics and contour results that aid the user in determining the integrity and suitability of designs. Analysis information can then be used with other CAD/CAM/CAE applications to enhance the development process and ensure the quality of designs prior to production.

Benefits

Interactively predict the dynamic responses of a structure

Import, generate, sort, edit and manage a wide range of analytical files

Compute, display and create reports on response functions and results

Export response data to other analysis tools or model databases

Features

Define models via FE analysis or test measurements

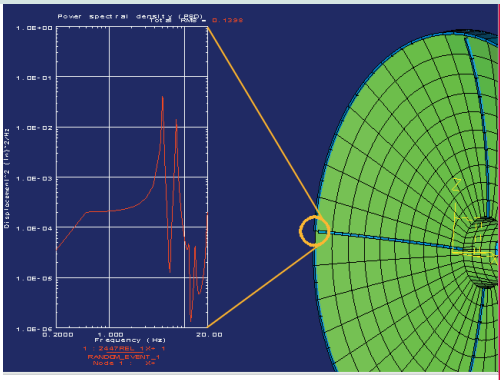
Perform six types of response analysis on structures

Use a wide range of excitation (loading) information to define events for analysis

Employ extensive XY graphics and contour display capabilities

Provide mathematical, statistical and signal processing tools

A flexible way to predict responses



NX I-deas Response Analysis provides you with the ability to interactively evaluate the forced responses of a structural model. A set of flexible tools allows you to measure the response functions and results for a model when a set of static, transient, frequency (harmonic), random vibratory or shock spectrum excitation is applied. The software can also be used as the post-processing toolset for the frequency responses calculated by the direct frequency response solver in NX Nastran.

Response Analysis enables you to import, generate and edit the excitation information from analysis or testing, including force, enforced motion and distributed loads (e.g., dynamic pressure).

The user can then apply excitations to the structure, controlling dynamic modes, static corrections and damping assumptions to define an event for analysis.

Motion, force and stress responses can be measured. Strength results can be generated for the whole structure or selected groups of nodes and elements by sorting through all time points or all frequencies for the maximum values. And elemental responses (e.g., stresses, strains, element forces and shell stress results) can be generated from displacements (mode shapes) as requested. Extensive graphics and contour display capabilities allow results to be reviewed and compared with other data or allowables.

Generating a model

Models can be prepared for analysis using either FE analysis software or test products. FE models contain nodes, elements and a set of static and/or dynamic modes. You can use NX I-deas capabilities in NX Nastran or third-party solvers (e.g., Nastran, Abaqus, or Ansys) to generate modal representation. Test models contain nodes, trace lines and a set of dynamic modes. The I-deas for Test products provided by Brüel & Kjær and Maya can be used to generate test modes.

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System requirements

NX I-deas Response Analysis shares the NX I-deas system requirements.

Recommended system configuration

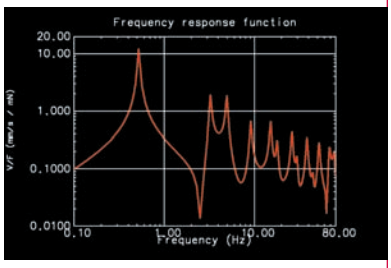
For information on particular operating systems or graphics cards, please visit http://support.ugs.com/online_library/certification/

A wide range of responses

Static response analysis. Compute the static response of a structure to a set of simultaneous time-varying static excitations using a linear superposition method.

Transient response analysis. Compute the dynamic response of a structure to a set of simultaneous transient excitations using either mode-acceleration or mode-displacement methods.

Frequency response analysis. Compute the steady-state response of a structure to a set of simultaneous oscillatory excitations defined by spectrum functions.



Random vibration analysis. Compute the power spectral density (PSD), root mean square (RMS) and level-crossing rates of the response of a structure to a set of simultaneous random excitations defined by PSD and cross spectral density functions.

Response spectrum analysis. Compute the peak response of a structure to a set of simultaneous base excitations defined by response spectrum functions. Different modal summation rules are available for peak calculations. The dynamic design analysis method (DDAM) is also allowed.

Direct frequency analysis. Post-process the frequency responses calculated by the direct frequency response solver.

Excitations

Type of excitation	*Type of response analysis*
Distributed load	Static, transient, frequency, random vibration
Nodal force	Transient, frequency, random vibration
Base excitation and enforced motion (displacement, velocity, acceleration)	Transient, frequency, random vibration, response spectrum
Impact	Transient
Rotating force and mass unbalance	Frequency

You can apply excitations to the model and control dynamic modes, static corrections and damping assumptions to define an event.

Data processing tools

- Import/export data from/to universal files (NX I-deas), time history files (MTS), RPC III files (MTS), DAC files (nCode) and spreadsheet text files
- Perform mathematical and statistical processing and calculations
- Manage, sort and edit an extremely high volume of functions in multiple files
- Leverage XY and XYZ graphics for display and probing
- Convert functions between time domain and frequency domain (e.g., PSD or spectrum functions)

Response analysis capabilities

Response result	*Type of analysis*	*Where generated*	*Software computes/displays/reports*
Response function (for XY graphics)	Static, transient, frequency, random vibration, direct frequency	At nodes, on elements	Displacement, velocity, acceleration, reaction force, element force, stress, strain, shell stress resultants
Response results datasets (for contour displays)	Static, transient, frequency	At given points in time: whole structure, selected nodes, selected elements. At given points in frequency: whole structure, selected nodes, selected elements	Displacement, velocity, acceleration, stress, strain, element forces, shell stress resultants, strain energy
Strength results (for contour displays)	Static, transient, frequency, random vibration, direct frequency	For the whole event: whole structure or selected elements	Maximum dynamic stresses under different loading conditions (same or different event types) can be normalized and combined into one results set for easier engineering judgement
RMS and level-crossing results* (for contour displays)	Random	Whole structure, selected nodes, selected elements	Displacement, acceleration, stress, element force, shell stress resultants
Peak values results** (for contour displays)	Response spectrum	Whole structure, selected nodes, selected elements	Displacement, acceleration, stress, element force, shell stress resultants

*Also calculates RMS and level-crossing rate of the von Mises stresses for dynamic stress analysis.

**Also calculates peak von Mises stresses for dynamic stress analysis.

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