

Nan-classical Separated Dynamic Analysis of Connected Structures

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In big cities, industrial facilities, refineries, powerhouses and oil platforms, there are lots of adjacent structures that are connected by at least one connector. The damper is used as a useful tool to connect the structures. Many researchers have investigated the seismic behavior of connected structures using damper in their studies. The presence of a centralized damper at the junction between two constructions changes connected sets into non-classical systems, so the non-classical method should be used to analyze it. The non-classical analysis method equations are complicated and time-consuming, and their use is not common as well. On the other hand, if classical methods are used to analyze non-classical structures, the effect of the damping on the response of structures will be ignored and the result will be unrealistic. In this research, a non-classical separated dynamic analysis method has been introduced which by using it, connected structures by the damper are investigated separately and non-classically. In this method, the connected structures are separated from each other, then, by placing a spring and a centralized damper at the junction on each separated structure, the interaction between the structures is considered in the analysis of separated constructions. The separate analysis of the connected structures reduces the volume of computation in large constructions and by using simple relationships, calculates the final response of each structures with a proper accuracy. To evaluate the accuracy of the proposed method, various examples of 10, 15, 20 and 30-story buildings have been selected and by placing them alongside each other, various models of connected structures are formed. Then by using separated and non-classical dynamic analysis method, all examples are numerically analyzed and spectral displacement in the leveling of the roof and also the base shear for each of the structures are computed. To compare the obtained results with exact values, the whole of connected set in each of the examples is modeled and analyzed non-classically by using the MATLAB software. Comparison the results of separated and non-classical analysis with the exact method indicates that the accuracy of proposed method with a maximum of 12% error is desirable and acceptable in engineering terms.

Keywords

Connected structures, Separate dynamic analysis, Classical and non-classical modal analysis, Non-classical damping, Reduction factor for spectra, Spectral dynamic analysis.