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On the Accuracy of Basic Modal Displacement Method Considering Various Earthquakes

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Abstract : Time history seismic analysis is supposed to be the most accurate method to predict the seismic demand of structures. On the other hand, the required computational time of this method toward achieving the result is its main deficiency. While being applied in optimization process, in which the structure must be analyzed thousands of time, reducing the required computational time of seismic analysis of structures makes the optimization algorithms more practical. Apparently, the invented approximate methods produce some amount of errors in comparison with exact time history analysis but the recently proposed method namely, Complete Quadratic Combination (CQC) and Sum Root of the Sum of Squares (SRSS) drastically reduces the computational time by combination of peak responses in each mode. In the present research, the Basic Modal Displacement (BMD) method is introduced and applied towards estimation of seismic demand of main structure. Seismic demand of sampled structure is estimated by calculation of modal displacement of basic structure (in which the modal displacement has been calculated). Shear steel sampled structures are selected as case studies. The error applying the introduced method is calculated by comparison of the estimated seismic demands with exact time history dynamic analysis. The efficiency of the proposed method is demonstrated by application of three types of earthquakes (in view of time of peak ground acceleration).

Keywords : time history dynamic analysis, basic modal displacement, earthquake-induced demands, shear steel structures
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