

عنوان مقاله:

STOCHASTIC STRUCTURAL RESPONSE DURING EARTHQUAKE

محل انتشار:

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خلاصه مقاله:

Earthquake excitation as input parameter in structural dynamic analysis has several stochastic characteristics, which must be taken into account in the design of earthquake resistant structures. In this paper the stochastic characteristic of earthquakes includes the effect of stochastic acceleration amplitudes. The objective has been to study linear and nonlinear response statistics of a large structure using Karhunen-Loève expansion (KLE) and Monte Carlo simulation (MCS) as stochastic simulation tools. KLE is based on the spectral decomposition of the covariance matrix and is applicable for both stationary and non-stationary Gaussian processes. A finite element model of the new Svinesund bridge has been used as an example of a large structure. Stochastic linear response statistics of the bridge have been evaluated based on data samples from 56 moderate earthquakes. Comparisons have been made between the results from KLE and MCS and it has shown that KLE is more efficient than MCS. To reduce the seismic response of the bridge, base isolations have been added to the foundations. Stochastic nonlinear response statistics of the bridge based on data samples from 192 strong earthquakes have been evaluated and a comparison between the results with and without base isolations is made. The maximum accelerations of the connection arch-superstructure are substantially reduced for the isolated bridge, which results in reduction of the seismic response.

کلمات کلیدی:

earthquake excitation, Karhunen-Loève expansion, stochastic linear response statistics, base isolation, stochastic nonlinear response statistics, Monte Carlo simulation

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