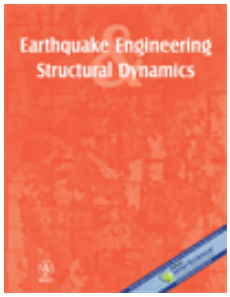

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Critical earthquake input power spectral density function models for engineering structures

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Abstract

The problem of determining optimal power spectral density models for earthquake excitation which satisfy constraints on total average power, zero crossing rate and which produce the highest response variance in a given linear system is considered. The solution to this problem is obtained using linear programming methods. The resulting solutions are shown to display a highly deterministic structure and, therefore, fail to capture the stochastic nature of the input. A modification to the definition of critical excitation is proposed which takes into account the entropy rate as a measure of uncertainty in the earthquake loads. The resulting problem is solved using calculus of variations and also within linear programming framework. Illustrative examples on specifying seismic inputs for a nuclear power plant and a tall earth dam are considered and the resulting solutions are shown to be realistic.

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