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Seismic Response Mitigation of Structures Using Base Isolation System Considering Uncertain Parameters

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Abstract : The present study deals with the performance of Linear base isolation system to mitigate seismic response of structures characterized by random system parameters. This involves optimization of the tuning ratio and damping properties of the base isolation system considering uncertain system parameters. However, the efficiency of base isolator may reduce if it is not tuned to the vibrating mode it is designed to suppress due to unavoidable presence of system parameters uncertainty. With the aid of matrix perturbation theory and first order Taylor series expansion, the total probability concept is used to evaluate the unconditional response of the primary structures considering random system parameters. For this, the conditional second order information of the response quantities are obtained in random vibration framework using state space formulation. Subsequently, the maximum unconditional root mean square displacement of the primary structures is used as the objective function to obtain optimum damping parameters Numerical study is performed to elucidate the effect of parameters uncertainties on the optimization of parameters of linear base isolator and system performance.

Keywords : linear base isolator, earthquake, optimization, uncertain parameters
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