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Vibration attenuation of high dimensional quasi-zero stiffness floating raft system

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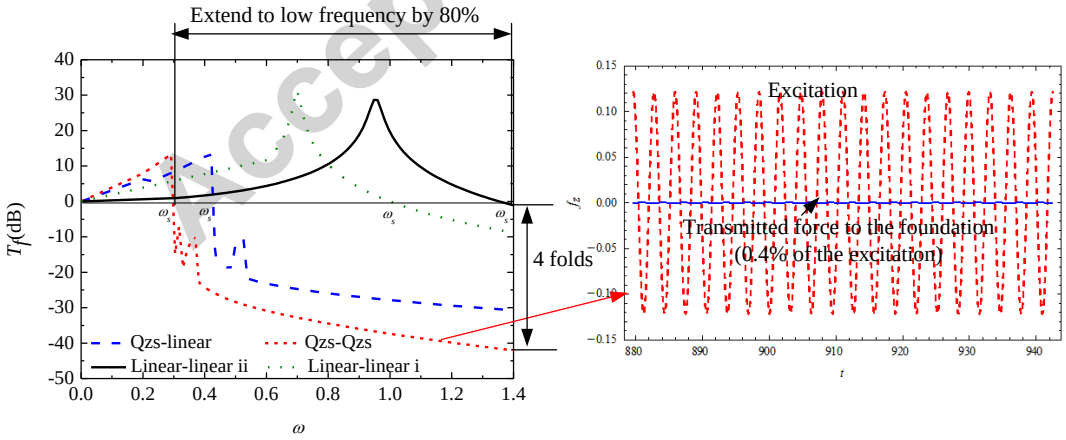
Abstract

This paper investigates the vibration attenuation performance of a floating raft system with quasi-zero stiffness (QZS) isolators. A high dimensional mathematical model of the floating raft system with 12 degrees of freedom (DOF) is established for dynamics analysis. The harmonic balance method is adopted to obtain the analytical solution of the high dimensional and coupled system, which permits the study of the nonlinear characteristic and mechanism of the QZS system. The results show that the QZS –QZS system has the lowest force transmissibility and the lowest frequency band for vibration isolation, which is a promising candidate for low frequency vibration isolation even in high dimensional systems. The vibration isolation region of the QZS-QZS system extends to low frequency by 80% compared with the 1 DOF linear system. The force transmissibility of the QZS-QZS system is four times lower than that of the corresponding linear system in vibration isolation region. Amplitudes of the transmitted forces in the x, y, and z directions are 9.8%, 9.8%, and 0.4% of the corresponding excitations.



Graphical Abstract