

Theoretical Investigation on the Dynamic Characteristics of One Degree of Freedom Vibration System Equipped with Inerter of Variable Inertance

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Abstract : In this paper, a theoretical investigation on the dynamic characteristics of one degree of freedom vibration system equipped with inerter of variable inertance, is presented. Differential equation of movement was solved under proper initial conditions in the case of free undamped/damped vibration, considered in the absence/presence of the inerter in the mechanical system. Influence of inertance on the amplitude of vibration, phase angle, natural frequency, damping ratio, and logarithmic decrement was clarified. It was mainly found that the inerter decreases the natural frequency of the undamped system and also of the damped system if the damping ratio is below 0.707. On the other hand, the inerter increases the natural frequency of the damped system if the damping ratio exceeds 0.707. Results obtained in this work are useful for the adequate design of inerters.

Keywords : damping, frequency control, inerter, one degree of freedom vibration system, parallel connection, variable inertance

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