

论文

质量弹簧阻尼旋转系统的动频和复模态运动

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摘要:

为探讨复杂结构在离心振动复合环境下的动力学行为,建立了旋转系统的动力学方程,计算了系统的特征频率和复模态矢量,并对复模态矢量进行复分解,得到了系统复模态运动的表征. 研究表明,两自由度质量弹簧阻尼旋转系统存在特征频率和2阶复模态;系统特征频率与旋转系统的转速有关,并受离心软化和科氏阻尼的影响;科氏阻尼导致系统出现复模态矢量,质点做极化的圆运动,说明科氏阻尼引起了旋转系统的运动耦合;科氏阻尼不是物理阻尼,不引起系统自由振动的衰减.

关键词: 旋转系统 离心软化;科氏力 复模态 圆螺旋运动

Dynamic Frequencies and Complex Modal Motion of Mass-Spring-Damping Rotating System

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Abstract:

In order to provide a basis for researching the dynamic behavior of engineering structures in a centrifugal and vibration compound environment, dynamic equations for a mass-spring-damping rotating system with two degrees-of-freedom were set up, and the eigenfrequencies and complex modal vectors of the system were calculated. The complex decomposition of the complex modal vectors were carried out to obtain the expression of complex modal motion. The research result shows that the mass-spring-damping rotating system has dynamic frequencies and two complex modes. The eigenfrequencies of the system are related to its rotation speed and influenced by centrifugal softening and Coriolis damping. Coriolis damping makes the system eigenvectors be complex modal vectors and mass point motion be a polarized circle to show that Coriolis damping produces a motion coupling. Coriolis damping is not real physical damping, so it does not result in the attenuation of free vibration of the system.

Keywords: rotating system centrifugal softening Coriolis force complex mode helix circular motion

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