

## 속도와 압력의 항의 마찰상수를 갖는 마찰기인 4자유도계 자려진동 시스템의 비선형 해석

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### Nonlinear analysis of a 4-dof friction induced self-oscillation system with the friction coefficient of velocity and pressure

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**Key Words** : Limit Cycle(극한 사이클), Stick-slip(스틱 슬립), Self-excited Vibration(자려 진동) .

**Abstract** : Four degrees of freedom mathematical model is presented to describe the fundamental mechanisms of the disc brake squeal noise. A contact parameter is introduced to describe the coupling between the in-plane and the out-of-plane motions. The friction coefficient including "relative velocity" and "normal force" can be generally formulated as the form of multiplication with polynomial parameters( $\beta, \gamma$ ). This introduces a new type of friction law that depends on both the in-plane and the out-of plane motions. Using this friction law, a contact stiffness matrix along the normal direction can be obtained.

## 축방향 왕복운동을 하는 외팔보의 복합변형변수를 이용한 비선형 모델링 및 주파수 응답특성

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### Nonlinear Modeling Employing Hybrid Deformation Variables and Frequency Response Characteristics of a Cantilever Beam Undergoing Axially Oscillating Motion

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**Key Words** : Oscillating Motion(왕복운동), Hybrid Deformation Variables(복합변형변수), Frequency Response Characteristics(주파수 응답특성), Cantilever Beam(외팔보), Nonlinear Modeling(비선형 모델링)

**Abstract** : A modeling method for cantilever beams undergoing axially oscillating motion is presented in this paper. Hybrid deformation variables are employed for the modeling method. Frequency response characteristics are investigated with the modeling method. It is shown that the geometric nonlinear effects of stretching and curvature play important roles to accurately predict the dynamic response.