자유단에 집중질량을 갖는 캔틸레버형 변단면 보의 자유진동

오상진† (담양대학) · 이재영*(호원대학교) · 박광규**(대전대학교) · 모정만***(전주농림고)

Free Vibrations of Tapered Cantilever-Type Beams with Tip Mass at the Free End

Sang Jin Oh, Jae Young Lee, Kwang Kyou Park and Jeong Man Mo

Key Words : tapered beam, general boundary condition, free vibration, natural frequency, tip mass

Abstract : The purpose of this paper is to investigate the natural frequencies and mode shapes of tapered beams with general boundary condition(translational and rotational elastic support) at one end and carrying a tip mass of rotatory inertia at the other end. The beam model is based on the classical Bernoulli-Euler beam theory which neglects the effects of rotatory inertia and shear deformation. The governing differential equation for the free vibrations of linearly tapered beams is solved numerically using the corresponding boundary conditions. Numerical results are compared with existing solutions by other methods for cases in which they are available. The lowest three natural frequencies and the corresponding mode shapes are calculated over a wide range of section ratio, dimensionless spring constant, mass ratio, and dimensionless mass moment of inertia.

Free Vibrations of Arches in Rectangular Coordinates

李太銀† (圓光大) · 安大淳*(新韓開發技術團) · 金英一**(錦湖産業) · 李炳求***(圓光大)

直交座標系에 의한 아치의 自由振動 解析

Tae Eun Lee, Dae Soon Ahn, Young Il Kim and Byoung Koo Lee

Key Words : Cartesian coordinates, free vibration, harmonic motion, arch, mode shape, natural frequency, rotatory inertia, unsymmetric axis, variable curvature.

Abstract : The differential equations governing free vibrations of the elastic arches with unsymmetric axis are derived in the rectangular coordinates rather than in polar coordinates, in which the effect of rotatory inertia is included. Frequencies and mode shapes are computed numerically for parabolic arches with both clamped ends and both hinged ends. Comparisons of natural frequencies between this study and SAP 2000 are made to validate theories and numerical methods developed herein. The convergent efficiency is highly improved under the newly derived differential equations in the rectangular coordinates. The lowest four natural frequency parameters are reported, with and without the rotatory inertia, as functions of three non-dimensional system parameters: the rise to chord length ratio, the span length to chord length ratio, and the slenderness ratio. Also typical mode shapes of vibrating arches are presented.