물에 잠긴 다공 직사각평판의 실험적 모드해석

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Experimental Modal Analysis of Perforated Rectangular Plates Submerged in Water

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Key Words : experimental modal analysis, fluid-structure interaction, hydroelastic vibration, perforated plate, added mass, clamped boundary condition, rectangular plate, triangular hole pattern.

Abstract : This paper dealt with an experimental study on the hydroelastic vibration of clamped perforated rectangular plates submerged in water. The penetration of holes in the plates had a triangular pattern with P/D (pitch to diameter) 1.750, 2.125, 2.500, 3.000 and 3.750. The natural frequencies of the perforated plates in air were obtained by the analytical method based on the relation between the reference kinetic and maximum potential energies and compared with the experimental results. Good agreement between the results was found for the natural frequencies of the perforated plates in air. It was empirically found that the natural frequencies of the perforated plate in air increase with an increase of P/D, on the other hand, the natural frequencies of the plate submerged in water decrease with an increase of P/D. Additionally, the effect of the submerged depth on the natural frequency was investigated.

Strain Gauge의 Blade내 설치위치 최적화

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Robust Optimal Positioning of Strain Gauges on Blades

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Key Words : signal-to-noise ratio, mispositioning of gauge, the probability of gauge failure

Abstract : This paper focuses on the formulation and validation of an automatic strategy for the selection of the locations and directions of strain gauges to capture at best the modal response of a blade in a series of modes. These locations and directions are selected to render the strain measurements as robust as possible with respect to random mispositioning of the gauges and gauge failures. The approach relies on the evaluation of the signal-to-noise ratios of the gauge measurements from finite element strain data and includes the effects of gauge size. A genetic algorithm is used to find the strain gauge locations-directions that lead to the largest possible value of the smallest modal strain signal-to-noise ratio, in the absence of gauge failure, or of its expected value when gauge failure is possible. A fan blade is used to exemplify the applicability of the proposed methodology and to demonstrate the effects of the essential parameters of the problem, i.e. the mispositioning level, the probability of gauge failure, and the number of gauges.