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COMMENTS ON "MODAL PROPERTIES OF BEAMS AND PLATES ON RESILIENT SUPPORTS WITH ROTATIONAL AND TRANSLATIONAL COMPLEX STIFFNESS"

P. A. A. Laura and C. A. Rossit

Institute of Applied Mechanics (*CONICET*) *and Department of Engineering*, *Universidad Nacional del Sur*, 8000-*Bahi a Blanca*, *Argentina*

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The authors are to be congratulated for their important investigation dealing with the effects of damped compliant boundary conditions on modal parameters in the case of two types of continuous systems: an elastic beam and a circular plate (reference [1]). The writers wish to comment briefly also on some of the concluding remarks made by the authors, specifically those concerning (1) vibrating circular plates having non-uniform flexible edge constraints and (2) vibrating rectangular plates with flexible edge supports.

As correctly stated by the authors in the case of a vibrating circular plate having non-uniform flexible edge restraint, the varying stiffness can be represented in terms of Fourier series in the polar angle. The frequency coefficients are then obtained from an infinite secular determinant. This approach has been followed by Leissa and associates in reference [2].†

When dealing with a vibrating rectangular plate with flexible edge supports, a general analytical solution has also been obtained in the case of edges elastically restrained against rotation and when the flexibility coefficients are not uniform at a given edge [3]. It was also shown in reference [3] that the exact fundamental frequency coefficients were in good agreement with those determined by means of a Rayleigh–Ritz solution where the fundamental mode shape was approximated using a very simple polynomial approximation proposed in reference [4].

It is also important to point out that a very general approximate approach for dealing with vibrations and acoustics problems using polynomial approximation has been developed by Berry [5]. Plates with elastic restraints at the supports are considered. Analytical and experimental results have been presented recently [6].

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† The displacement amplitude is expressed in terms of a generalized Fourier–Bessel expansion.

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AUTHORS' REPLY

K.-H. Kang and K.-J. Kim

Center for Noise and Vibration Control, *Department of Mechanical Engineering*, *KAIST*, *Science Town*, *Taejon* 305-701, *Korea*

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The authors thank Laura and Rossit for their interest in the authors' paper (reference [1]). To the authors' best knowledge, analytical eigensolutions for rectangular plate vibrations are available only for boundary conditions where at least two opposite edges are simply supported, i.e., infinitely restrained against translation and free against rotation [2–6]. Therefore, as Laura and Rossit indicated, the expression in the conclusion that no analytical solution is available for flexible supports may mislead the readers in some sense. Admitting, however, that general boundary supports are elastically restrained against not only rotation but also translation, it seems to be safe for the authors to say that general analytical solutions for flexible edge supports are not yet available.

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