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COMMENTS ON "DYNAMIC STABILITY OF SPINNING BEAMS OF UNSYMMETRICAL CROSS-SECTION WITH DISTINCT END CONDITIONS"

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The recent paper by Lee [1] deals with the formulation of the equations of motion in matrix form for the dynamic behaviour of a spinning beam of rectangular cross-section by using Hamilton's principle and the assumed mode method. The study is carefully carried out.

Results of the determination of the critical dimensionless spinning speeds, corresponding to the divergence-type instability of the beam, have been presented for various combinations of prescribed cross-section and end conditions for the transverse vibrations in two principal directions of the same.

Apparently, Professor Lee is not aware of the paper reported in reference [2]. Here we wish to point out that in this reference the main purpose was to examine the existence (or not) of instabilities of a spinning uniform beam, carrying an axial dead load, having a cross-section with at least two symmetry axes and, in general, $I_x \neq I_y$. Internal damping was also taken into account by means of the viscoelastic behaviour of the beam material described by the Kelvin–Voigt model. The general problem ($I_x/I_y \neq 1$) exhibits interesting features that were readily observed in the space of the control external parameters: the spin velocity and the axial load. In particular, the case of a simply supported beam was presented in detail.

In addition, it is interesting to indicate that, as early as 1990, the same authors had analyzed in reference [3], through an example, the free vibration coupling of bending and torsion of a uniform spinning beam. Comparison was made with previous works on bending without torsional coupling and torsion neglecting bending coupling. The analysis of the dynamic stability of this case would be an interesting research topic.

Also, and within the spinning beam vibration subject, the authors have published two other papers in this *Journal* [4, 5].

In the other hand, the analysis of a model that is as realistic as possible is always desirable, which implies the addition of diverse complexities. Here the consideration of damping, a non-constant rotational speed, and geometric and/or material non-linearities—amongst others—may be relevant. As is known, the inclusion of dissipation mechanisms can modify the stability of the studied system. The addition of external damping stabilizes the system but, on the contrary, the addition of internal damping may have a destabilizing effect. With respect to the rotational speed, in the two papers by Kammer and Schlack [6, 7] the angular speed was expressed as the sum of a steady state value and a small periodic perturbation. The KBM method was applied to derive approximate solutions and expressions for the boundaries of the unstable regions. In addition, the inclusion of dissipation mechanisms the effect of the initial stress variation cannot be neglected if the rotational speed is not constant.

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REFERENCES

1. H. P. Lee 1996 *Journal of Sound and Vibration* **189**, 161–171. Dynamic stability of spinning beams of unsymmetrical cross-section with distinct end conditions.
2. M. B. Rosales and C. P. Filipich 1993 *Journal of Sound and Vibration* **163**, 283–294. Dynamic stability of a spinning beam carrying an axial dead load.
3. C. P. Filipich and M. B. Rosales 1990 *Journal of Sound and Vibration* **141**, 375–387. Free flexural–torsional vibrations of a uniform spinning beam.
4. C. P. Filipich, M. J. Maurizi and M. B. Rosales 1989 *Journal of Sound and Vibration* **129**, 350–355. A note on the free vibration of a spinning beam.
5. C. P. Filipich and M. B. Rosales 1990 *Journal of Sound and Vibration* **140**, 341–345. On avoiding skew-symmetry and complex arithmetic in a spinning beam.
6. D. C. Kammer and A. L. Schlack, Jr. 1987 *Journal of Applied Mechanics* **54**, 305–310. Effects of non-constant spin rate on the vibration of a rotating beam.
7. D. C. Kammer and A. L. Schlack, Jr 1987 *Journal of Vibration*, *Acoustics*, *Stress and Reliability in Design* **109**, 138–143. Dynamic response of a radial beam with non-constant angular velocity.