Journal of Sound and Vibration (1998) **215**(5), 1181–1182
Article No. sv971658

LETTERS TO THE EDITOR

COMMENTS ON "VIBRATION ANALYSIS OF CIRCULAR MINDLIN PLATES USING THE DIFFERENTIAL QUADRATURE METHOD"

P. A. A. Laura and D. V. Bambill
Institute of Applied Mechanics (*CONICET*) *and Department of Engineering*, *Universidad Nacional del Sur*, 8000 *Bahí a Blanca*, *Argentina*

(*Received* 30 *December* 1997)

The authors are to be congratulated for their excellent paper and useful numerical results [1]. In particular their analysis of vibrating simply supported and clamped circular plates with a rigid centre support deserves special credit since this is a rather difficult but quite an important problem.

On the other hand, it would have been very useful to also obtain frequency coefficients for the case of a centre support for more moderate values of the ratio h/a (where h = plate thickness and a = outer radius of the plate), say $h/a = 0{\cdot}05$ and $0{\cdot}10$.

When $h/a = 0{\cdot}25$ it would seem appropriate to obtain a mathematical theory of dynamic elasticity solution and then ascertain the accuracy of the Mindlin plate theory.

When dealing with the case of a centre support and thin plate theory two extremely simple approximate solutions have also appeared in the literature [2, 3]. A comparison of results is shown in Table 1.

The results quoted in reference [4] are obtained using an exact analytical approach. From a practical viewpoint excellent agreement is achieved between the results obtained using different methodologies. In the case of the simply supported outer boundary, the fundamental frequency coefficient determined in reference [1] is somewhat higher than the other results, while excellent agreement is achieved between references [1] and [4] in the case where the outer boundary is clamped.

Table 1

Comparison of fundamental frequency coefficients of simply supported and clamped circular plates with a centre support

	Fundamental frequency coefficient	
	Simply supported	Clamped
[1][a]	14·872	22·736
[2]	14·82	22·78
[3]	14·839	22·883
[4]	14·80	22·70

[a] Determined by means of Mindlin theory for $h/a = 0{\cdot}001$.

ACKNOWLEDGMENTS

The present study is sponsored by Secretarí a General de Ciencia y Tecnología of Universidad Nacional del Sur and by CONICET (PIA 6002/96).

0022–460X/98/351181 + 02 $30.00/0

REFERENCES

1. K. M. Liew, J. B. Han and Z. M. Xiao 1997 *Journal of Sound and Vibration* **205**, 617–630. Vibration analysis of circular Mindlin plates using the differential quadrature method.
2. V. H. Cortínez and P. A. A. Laura 1986 *Journal of Sound and Vibration* **104**, 533–535. A note on vibrating membranes and plates with an internal support.
3. M. N. Pavlovic and F. C. Mbakogu 1996 *Journal of Sound and Vibration* **198**, 389–394. Rayleigh estimates of the fundamental frequencies of vibration of circular plates.
4. A. W. Leissa 1969 *NASA SP* 160. Vibration of plates.

AUTHORS' REPLY

K. M. Liew*

Department of Mechanical Engineering, *Massachusetts Institute of Technology*, *Cambridge*, *MA* 02139, *U.S.A.*

AND

J.-B. Han and Z. M. Xiao

School of Mechanical and Production Engineering, *Nanyang Technological University*, *Singapore* 639798

(*Received* 30 *March* 1998)

We are delighted to see Drs Laura and Bambill show interest in our recent article [1]. We appreciate their valuable comments [2]. The primary purpose of reference [1] is to present the Mindlin plate solutions to thick circular plates using the differential quadrature method. Besides, it [1] also covers the vibration solutions for thin circular plates. In their short letter to the editor, Drs Laura and Bambill have presented a useful comparison between the authors' work [1] and others [3–5] for some selected cases. This has further validated the accuracy of the authors' solutions, and thus the accuracy of the differential quadrature method.

REFERENCES

1. K. M. Liew, J.-B. Han and Z. M. Xiao 1997 *Journal of Sound and Vibration* **205**, 617–630. Vibration analysis of circular Mindlin plates using the differential quadrature method.
2. P. A. A. Laura and D. V. Bambill 1998 *Journal of Sound and Vibration* (in press). Comments on "Vibration analysis of circular Mindlin plates using the differential quadrature method".
3. V. H. Cortinez and P. A. A. Laura 1996 *Journal of Sound and Vibration* **104**, 533–535. A note on vibrating membranes and plates with an internal support.
4. M. N. Pavlovic and F. C. Mbakogu 1996 *Journal of Sound and Vibration* **198**, 389–394. Rayleigh estimates of the fundamental frequencies of vibration of circular plates.
5. A. W. Leissa 1969 *NASA SP* 160. Vibration of plates.

* On sabbatical leave from School of Mechanical and Production Engineering, Nanyang Technological University, Singapore 639798.