Table 1 **Modifications of equations**

Order of equation in Ref. 1 [Eqs. (1)]	Multiplier
1	-1
4	-1
6	ρ
7	ρ
5	ρ
8	$\lambda^2\rho$
2	-1
3	-1

For the solution of the resulting system of equations, in addition to the numerical integration technique (references cited in Ref. 1), matrix progression[3] and modified finite-difference methods[4] have been efficiently used.

The purpose of this comment is twofold. First, to recast the governing equations [Eqs. (1)] into a simpler form with a symmetric coefficient matrix (A) which is particularly useful when finite-difference method is used for the solution, and second, to point out a number of misprints in Eqs. (3a–3x).

The modified form of the equation is obtained by choosing the fundamental unknowns $\{Z\}$ as follows

$$Z_1 = \rho t_\xi, \quad Z_2 = \lambda^2 \rho m_\xi, \quad Z_3 = u_\theta, \quad Z_4 = W$$

$$Z_5 = u_\xi, \quad Z_6 = \phi_\xi, \quad Z_7 = \rho \hat{t}_{\xi\theta}, \quad Z_8 = \rho \hat{f}_\xi$$

and then multiplying each equation by the coefficient shown in Table 1 and rewriting the resulting equations in the order shown in Table 1.

The modified form of the equations

$$BZ' - AZ = P$$

where

$$B = \begin{bmatrix} 0 & I_1 \\ -I_1 & 0 \end{bmatrix}$$

I_1 being diagonal submatrix and has the following form

$$[I_1] = \begin{bmatrix} -1 & & 0 & \\ & -1 & & \\ & 0 & 1 & \\ & & & 1 \end{bmatrix}$$

If the nodal values of the fundamental unknowns are arranged in the order just indicated above, a symmetric coefficient matrix for the finite-difference equations can be obtained.

It should be noted that a symmetric coefficient matrix can still be obtained for laminated orthotropic shells of revolution even when account is taken of the shear deformation (in which case the governing equations are ten first-order ordinary differential equations,[5] provided that the thermomechanical characteristics of the shell are independent of θ).

The following misprints in Ref. (1) have been noted; the correct forms are:

$$A_{11} = A_{44} = \tag{3a}$$

$$A_{12} = -A_{65} = \tag{3b}$$

$$A_{13} = -A_{75} = \tag{3c}$$

$$A_{15} = 1/b \tag{3d}$$

$$A_{21} = -A_{56} = \tag{3e}$$

$$A_{22} = -A_{77} = -\tfrac{1}{2}A_{66} = \tag{3f}$$

$$A_{23} = \gamma A_{24} = -A_{76} = -\lambda^2\gamma A_{86} = \gamma(\lambda^2 d/bc)(n/\rho)(3\omega_\theta - \omega_\xi) \tag{3g}$$

$$A_{26} = 2/\{bc(1-\nu)\} \tag{3h}$$

$$A_{31} = -A_{57} \tag{3i}$$

$$A_{42} = -(1/\lambda^2)A_{68} \tag{3k}$$

$$A_{43} = -(1/\lambda^2)A_{78} \tag{3l}$$

$$A_{48} = 1/d \tag{3m}$$

$$-A_{54} = \tag{3q}$$

$$A_{55} = \hat{A}_{88} = \tag{3w}$$

$$A_{87} = \tag{3x}$$

The two coefficients A_{63} and A_{72} are nonzero and are given by

$$A_{63} = A_{72} = b(1-\nu^2)(n/\rho)\omega_\theta[1 + (\lambda^2 d/b)\, n^2/\rho^2]$$

In addition, all the temperature terms in Eqs. (2b) should have a minus sign.

References

[1] Blech, J. J., "Unsymmetrical Bending of Shells of Revolution," *AIAA Journal*, Vol. 8, No. 3, March 1970, p. 567.

[2] Goldberg, J. E. and Bogdanoff, J. L., "Static and Dynamic Analysis of Nonuniform Conical Shells under Symmetrical and Unsymmetrical Conditions," *Proceedings of the 6th Symposium on Ballistic Missile and Aerospace Technology*, Vol. 1, Academic Press, New York, 1961.

[3] Jenkins, R. S. and Tottenham, H., "The Solution of Shell Problems by the Matrix Progression Method," *Proceedings of the World Conference on Shell Structures*, San Francisco, 1962.

[4] Noor, A. K. and Khandelwal, V. K., "Improved Finite-Difference Variant for the Bending Analysis of Arbitrary Cylindrical Shells," UNICIV Report R-58, Dec. 1969, Univ. of New South Wales.

[5] Noor, A. K., "Variational-Based Numerical Methods of Analysis of Shells of Revolution," to be published.

Reply by Author to A. K. Noor

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The author wishes to thank A. Noor on his comment. As to the choice of the fundamental unknowns, the author found that the system of equations as presented in his Note could be adequately solved by standard differential equations solver routines which are available nowadays as part of a library of subroutines of digital computers. In particular, the author used a Runge-Kutta fourth-order routine for the solution of the equations.

Concerning the second portion of the comment. The misprints which are pointed out were checked against the author's original notes. The author concurs with the corrections.

It seems that Eq. (3q) should read:

$$-A_{54} = -\lambda^2 A_{81} =$$

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