Improved approximations of the Rayleigh wave velocity

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Abstract: In this article we have derived some approximations for the Rayleigh wave velocity in isotropic elastic solids which are much more accurate than the ones of the same form, previously proposed. In particular: (1) A second (third)-order polynomial approximation has been found whose maximum percentage error is 29 (19) times smaller than that of the approximate polynomial of the second (third) order proposed recently by Nesvijski [Nesvijski, E. G., J. Thermoplas. Compos. Mat. 14 (2001), 356-364]. (2) Especially, a fourth-order polynomial approximation has been obtained, the maximum percentage error of which is 8461 (1134) times smaller than that of Nesvijski's second (third)-order polynomial approximation. (3) For Brekhovskikh-Godin's approximation [Brekhovskikh, L. M., Godin, O. A. 1990, Acoustics of Layered Media: Plane and Quasi-Plane Waves. Springer-Verlag, Berlin], we have created an improved approximation whose maximum percentage error decreases 313 times. (4) For Sinclair's approximation [Malischewsky, P. G., Nanotechnology 16 (2005), 995-996], we have established improved approximations which are 4 times, 6.9 times and 88 times better than it in the sense of maximum percentage error. In order to find these approximations the method of least squares is employed and the obtained approximations are the best ones in the space $L^2[0, 0.5]$ with respect to its corresponding subsets. ?? SAGE Publications 2008.

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