displacement decreases. This shows that using the range of frequencies, which are close to the maximum attainable one for string, is pointless in the case of the helicoidal multivibrator.

Flexural wave propagation. Recent studies of nanostructures' dynamics, such as dispersion of phase velocity v_{pc} in carbon nanotubes at high frequency vibration, are based on the different beam models: the traditional Euler-Bernoulli and Timoshenko elastic beams as well as their nonlocal elastic versions. All four models are effective at wavelengths that are larger than 6.3×10^{-9} m. Predictions of flexural waves dispersion at very high frequencies (in THz region) with wavelengths less than 3×10^{-9} m more effective on the basis of the Timoshenko nonlocal elastic beam vibration (*see* L. Wang and H. Hu, 2005). The Timoshenko nonlocal elastic beam takes not only the rotary inertia (Rayleigh correction) and shear deformation, but also the second-order gradient of strain which characterizes the microstructure of the system under consideration. These considerations are important for high frequencies when a vibrating beam is subdivided by nodal cross sections into comparatively short portions. For example, the influence of shear and rotation inertia on the simply supported short rectangular beam's frequency of oscillations may be represented (*see* Ya.G. Panovko, 1968) by the following formula: $f_k^* = f_1 \frac{k_w \lambda_{\rho L}}{\pi} \sqrt{\frac{1}{2}\left(B_{kL} \pm \sqrt{B_{kL}^2 - 4\beta_{GE}^2}\right)}$,

where $f_1 = \frac{\pi}{2L^2}\sqrt{\frac{EJ}{m}}$ is the lowest resonance frequency calculated without account for the shear and rotation inertia, m is the mass per unit length of the beam, $B_{kL} = 1 + \beta_{GE}^2 + \frac{\beta_{GE}^2 \lambda_{\rho L}^2}{\pi^2 k_w^2}$; β_{GE} is the factor depending on the cross section geometry (β_{GE} =1.2 for rectangular cross section); $\lambda_{\rho L} = L/\rho_{gr}$ is the beam's flexibility, ρ_{gr} is the radius of cross section gyration, and k_w is the number of half-waves in the beam at oscillations. Another useful formula based on the Rayleigh –Timoshenko model is shown in Weaver *et al.* (1990) publication where one can see an influence of shear and rotation inertia on the frequency of a short simply supported beam. Let us recall that the shear deformation in static contributes under uniform load only few percents to the comparatively short prismatic cantilever free end total deflection which depends on the square of the ratio of depth of the beam to its length L (*see* J. T. Oden, E. A. Ripperger , 1981).

Practical applications of the problems discussed in Part A of the book are shown in Chap. 8 of Part B. *See* also Y.M. Tseytlin, Rev. Sci. Instrum. 79, 025102 (2008) with the development of kinetostatic method for atomic force microscope cantilevers' spring constant evaluation at higher mode oscillations and Y.M. Tseytlin Paper TP007IIS006 in the Proceed. 53rd Intern. Instrum. Symp. ISA, Tulsa, OK, 2007 with the development of nanometrology methods.

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