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BILATERAL BOUNDS OF STABILITY OF AN ELASTIC CANTILEVER BAR COMPRESSED OVER A CONNECTING ROD

The authors present both top and bottom limit values of loads within the two problems of stability of a rectilinear elastic cantilever bar that has a variable cross-section. In the first problem, a longitudinal compressive force applied to the bar end is transmitted through a connecting rod that has hinges on both ends, while the second problem is to be resolved in absence of any connecting rod.

The authors apply well-known expressions to identify the stability loss by a rectilinear elastic cantilever bar that has a constant cross-section compressed by a longitudinal force at its free end, with account for the inequalities generated by the best approximation problem in the Hilbert space. They constructed two series of functionals, the bottom bounds of which are the bilateral bounds of the unknown critical value of the load parameter. The calculation of the bottom bounds is reduced to determination of the biggest eigenvalues for the matrices presented in the form of second-order matrices with elements, expressed through the integrals of well-known forms of stability loss by a bar that has a constant cross-section. The calculation of the top bound is reduced to the determination of the biggest eigenvalue for the matrix which almost coincides with the one of the block matrices constructed for the determination of the bottom bound.

Bilateral bounds identified in accordance with the above method make it possible to assess the reduction of the critical load value in the first problem and to compare it to the one of the second problem.

Key words: stability, elastic bar, consolidated, connecting rod, critical load, bilateral evaluations, eigenvalues.

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