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Stability of Parametrically Excited Structures: New Results

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Linear dynamical systems with many degrees of freedom with periodic coefficients also depending on constant parameters are considered. First and second order derivatives of the Floquet matrix with respect to parameters are derived in terms of matriciants of the main and adjoint problems and derivatives of the system matrix. Then, linear vibrational systems with periodic coefficients depending on three independent parameters: frequency and amplitude of periodic excitation, and damping parameter are considered. For arbitrary matrix of periodic excitation and positive definite damping matrix general expressions for regions of the main (simple) and combination resonances are derived. Two important specific cases of excitation matrix are studied. It is shown that in both cases the resonance regions are halves of cones in the three-dimensional parameter space. As an example of the developed theory Bolotin's problem on dynamic stability of a beam loaded by periodic bending moments is solved.

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