

## Forced vibration of the hydro-elastic system consisting of the orthotropic plate, compressible viscous fluid and rigid wall

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**Abstract.** This paper studies the forced vibration of the hydro-elastic system consisting of the anisotropic (orthotropic) plate, compressible viscous fluid and rigid wall within the scope of the exact equations and relations of elastodynamics for anisotropic bodies for describing of the plate motion, and with utilizing the linearized exact Navier-Stokes equations for describing of the fluid flow. For solution of the corresponding boundary value problem it is employed time-harmonic presentation of the sought values with respect to time and the Fourier transform with respect to the space coordinate on the coordinate axis directed along the plate length. Numerical results on the pressure acting on the interface plane between the plate and fluid are presented and discussed. The main aim in this discussion is focused on the study of the influence of the plate material anisotropy on the frequency response of the mentioned pressure. In particular, it is established that under fixed values of the shear modulus of the plate material a decrease in the values of the modulus of elasticity of the plate material in the direction of plate length causes to increase of the absolute values of the interface pressure. The numerical results are presented not only for the viscous fluid case but also for the inviscid fluid case.

**Keywords:** compressible viscous fluid; anisotropic plate; interface pressure; forced vibration; hydro-elastic system; fourier transform

### 1. Introduction

The use of composite materials in ship and submarine building, and as well as water turbine blades requires to study of the problems related to the interaction between the structural members made of composite materials (for instance, such as composite plates and shells) and fluids. It is evident that in these investigations as the first step may be taken the generalization of the classical interaction problems regarding the isotropic plates (or shells) and fluids for the anisotropic plates (or shells) and fluids. Namely this approach is taken in the present paper and it is made the attempt to investigate the forced vibration of the hydro-elastic system consisting of the anisotropic (orthotropic) plate compressible barotropic viscous fluid and the rigid wall. The isotropic plate

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