

# **Nonlinear Regular and Chaotic Bending Vibrations of a Rotating Shaft**

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## **ABSTRACT**

In the existing literature of the subject, flexural vibrations and critical speeds of rotors have been studied by considering various models. In this paper bending vibrations of a rotating shaft are examined in an environment of critical parameters of self-excited vibrations of the shaft, which is subjected to a nonlinear compressing axial force.

The shaft is supported by articulated joints at both ends. External and structural dampings in the shaft are taken into consideration. The nonlinear compressing axial force acting in the shaft is a result of an external action and a flexibility of the shaft axis. The solution is determined in the form of series expansion with respect to eigenfunctions of the suitable boundary value problem. Making use of the Galerkin method a nonlinear differential equations set is developed which has been numerically analysed.

Stability and bifurcations of solution of this nonlinear set of equations have been determined and regular or chaotic vibration regions have been found.