**Title:** Modelling a Rotating Shaft as an Elastically Restrained Bernoulli-Euler Beam

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**Abstract:** Industrial rotating machines may be exposed to severe dynamic excitations due to resonant working regimes. Dealing with the bending vibration, problem of a machine rotor, the shaft - and attached discs - can be simply modelled using the Bernoulli-Euler beam theory, as a continuous beam subjected to a specific set of boundary conditions. In this study, the authors recall Rayleigh's method to propose an iterative strategy, which allows for the determination of natural frequencies and mode shapes of continuous beams taking into account the effect of attached concentrated masses and rotational inertias, including different stiffness coefficients at the right and the left end sides. The algorithm starts with the exact solutions from Bernoulli-Euler's beam theory, which are then updated through Rayleigh's quotient parameters. Several loading cases are examined in comparison with the experimental data and examples are presented to illustrate the validity of the model and the accuracy of the obtained values.

**Author Keywords:** Transverse Vibration of Beams; Elastic Supports; Torsional Stiffness Coefficients

**Keywords Plus:** Rotatory Inertia; Point Masses; Vibrations; Singularities; Behavior; Ends

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