

Compression and Torsion of Shaft with Variable Flexural Stiffness

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We consider the nonlinear (by parameter λ) eigenvalue problem

$$-\left[\alpha(\alpha z'')'\right]' - M^2 z'' = \lambda[(\alpha z')' + \alpha z''] + \lambda^2 z, \quad x \in (0, l), \quad (1)$$

$$z(0) = z(l) = 0, \quad \left[(\alpha(x)z''(x))' + \lambda z'(x) + \frac{M^2}{\alpha(x)}z'(x)\right]_{x=0}^{x=l} = 0, \quad (2)$$

which arises in research of a problem of a stability of a shaft in length l with a variable flexural stiffness $\alpha(x)$ under action of the contracting force $P = \lambda$ and the rotating moment M . For research of spectral properties of a problem (1), (2) we used the concept of quasi-derivatives introduction.