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THE EIGENVALUE PROBLEM FOR ONE-DIMENSIONAL DIFFERENTIAL OPERATOR WITH VARIABLE COEFFICIENT SUBJECT TO INTEGRAL CONDITIONS

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We consider the eigenvalue problem for one-dimensional differential operator with variable coefficient subject to nonlocal integral conditions

$$\frac{\mathrm{d}}{\mathrm{d}x}\Big(p(x)\frac{\mathrm{d}u}{\mathrm{d}x}\Big) + \lambda u = 0, 0 < x < 1, \tag{1}$$

$$u(0) = \gamma_1 \int_0^1 u(x)\mathrm{d}x, \tag{2}$$

$$u(1) = \gamma_2 \int_0^1 u(x)\mathrm{d}x. \tag{3}$$

At the beginning we investigate theoretically how eigenvalues depend on the type of function $p(x)$ (symmetric, increasing or decreasing). After that, this problem is solved numerically. Also we analyze how the eigenvalues depend on the parameters γ_1, γ_2.

We prove some properties of the spectrum for this differential problem. We consider the cases in which there appears zero, negative and positive eigenvalues. The area of multiple or complex eigenvalues is alalyzed. The results of numerical experiments are presented.

The case of constant coefficient in differential equation was analyzed earlier in the articles [1], [2].

REFERENCES

[1] M.P.Sapagovas. On the stability of finite-difference schemes for one-dimensional parabolic boundary-value problems. *Lithuanian Math.J.*, **48** (3), 2008, 339 – 356.

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