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ABSTRACTS

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CALCULATION OF HEAT EXCHANGE COEFFICIENT ON THE BOUNDARY OF A SOLID BODY USING TEMPERATURE MEASUREMENTS INSIDE THE BODY

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To model heat exchange processes mathematically, one should know temperature distribution at a fixed moment of time and laws of heat exchange on the boundary of a body. These laws are often determined by technical means, for instance, using temperature measurements on the surface, or calculable, with knowing amount of supplied heat. If it is impossible, then boundary conditions must be determined by measuring temperature at an inner point of the body. One-dimensional temperature field is described as follows:

$$\frac{\partial t}{\partial \tau} = a^2 \left(\frac{\partial^2 t}{\partial x^2} + \frac{k-1}{x} \frac{\partial t}{\partial x} \right), \quad x \in (0, b), \tag{1}$$

$$t(x, 0) = t_0(x). \tag{2}$$

Boundary conditions are unknown but the change of temperature at an inner point of the body is known:

$$t(x_1, \tau)) = t_1(\tau), \quad x_1 \in (0, b). \tag{3}$$

Thus, $t(b, \tau)$ and the heat exchange coefficent a should be calculated using the following boundary conditions of the third type:

$$\lambda \frac{\partial t(b, \tau)}{\partial x} = \alpha(t_e(\tau) - t(b, \tau)), \tag{4}$$

where $t_e(\tau)$ is the temperature of the surrounding medium.

The problem is solved using the method suggested in [1], [2].

REFERENCES

[1] A.G. Temkin. *Inverse methods of heat conduction.* Energya, Moscow, 1973. (in Russian)

[2] I. Iltins. A. Temkin's method of separation of variables. *Scientific Proceedings of Riga Technical University, Series: Computer Science*, **47:** 55–61, 2005.