

# SOLUTIONS OF HEAT-CONDUCTION PROBLEMS IN A HOLLOW CYLINDER BY USING TRANSFER FUNCTIONS

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A technique is described for solving heat-conduction problems in a hollow cylinder by determining the so-called transfer functions which relate temperatures at points in the body to the perturbing action (temperature of a heated surface or coolant, heat flux) in the field of Laplace transforms.

By using methods for solving inverse heat-conduction problems it is relatively easy to use an analog computer to find rational transfer functions for a hollow cylinder with boundary conditions of the first and second kinds. A problem with boundary conditions of the third kind and a variable heat-transfer coefficient is solved by using a transfer function for boundary conditions of the second kind.

Block diagrams are given for solving the problems on an analog computer.

Results calculated by the method described are compared with exact analytic solutions. By using the first three or four terms of the numerator and denominator of the transfer function the results are accurate enough for practical purposes except for very small values of the time.

The transfer function method also permits the detailed analysis of the heating of bodies by using methods developed in automatic control theory.

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