Homotopy Analysis Method for Variable Thermal Conductivity Heat Flux Gage with Edge Contact Resistance

Abdul Aziz[a], Farzad Khani[b], and Mohammad Taghi Darvishi[c]

[a] Department of Mechanical Engineering, School of Engineering and Applied Science,
   Gonzaga University, Spokane, WA 99258, USA
[b] Department of Mathematics, Bakhtar Institute of Higher Education, Ilam, Iran
[c] Department of Mathematics, Razi University, Kermanshah 67149, Iran

Reprint requests to F. K.; Fax: +98 841 2238527; farzad_khani59@yahoo.com

The homotopy analysis method (HAM) has been used to develop an analytical solution for the thermal performance of a circular-thin-foil heat flux gage with temperature dependent thermal conductivity and thermal contact resistance between the edge of the foil and the heat sink. Temperature distributions in the foil are presented illustrating the effect of incident heat flux, radiation emission from the foil, variable thermal conductivity, and contact resistance between the foil and the heat sink. The HAM results agree up to four places of decimal with the numerical solutions generated using the symbolic algebra package Maple. This close comparison vouches for the high accuracy and stability of the analytic solution.