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Enhancement of algorithm and investigation of heat transfer through fins

Abstract

Finite Element Method (FEM) and Differential Quadrature Method (DQM) are two very important numerical solution techniques to solve engineering and physical science problems. Usually elements are sub-divided uniformly in FEM (Conventional FEM, CFEM) to obtain temperature distribution behavior in a fin or plate. Hence, extra computational complexity is needed to obtain a fair solution with required accuracy. In this paper, non-uniform sub-elements are considered to enhance the CFEM algorithm to reduce the computational complexity. The proposed algorithm is known as Efficient FEM (EFEM).This EFEM is applied for the solution of one-dimensional heat transfer problem in convection-tip thin rectangular fin. Exact solutions are also obtained for comparison purpose. The obtained results are compared with CFEM and Efficient DQM (EDQM), with non-uniform mesh generation. It is found that the EFEM exhibits more accurate results than CFEM, EDQM and agrees with exact solution showing its potentiality.

Keywords

Efficient Differential Quadrature Method; Efficient Finite Element Method; Heat transfer