Proceedings of the Korean Nuclear Society Spring Meeting
Pohang, Korea, May 1999

Two Adjoint Solutions for the Analytic Function Expansion Nodal Method in the Hexagonal Geometry

Jae Man Noh, Keung Koo Kim, and Hyung Kook Joo
Korea Atomic Energy Research Institute
P. O. Box 105, Yusong, Taejeon, Korea 305-600
jmnoh@nanum.kaeri.re.kr

Abstract

The methods for obtaining the mathematical and the physical adjoint solutions to the neutron diffusion equation formulated with the equivalence theory in the hexagonal geometry are presented under the framework of the AFEN-type nodal methods. The mathematical adjoint coupling equations whose coefficients have the opposite meanings in a response matrix sense to those of the forward coupling equations are derived by transposing the forward nodal coupling equations. Although it has been believed that it is impossible or nearly impossible to derive the physical adjoint coupling equations when discontinuity factors are involved in nodal methods, the physical adjoint coupling equations are derived based on the adjoint current discontinuity across interfaces instead of the flux discontinuity in the forward coupling equations. Two adjoint fluxes have turned out to be identical in the case of finite difference formulation with discontinuity factors. The results of a numerical test show that the physical adjoint flux defined here is consistent to the mathematical adjoint flux even though discontinuity factors are involved.