The Application of the Analytic Basis Function Expansion Triangular-z Nodal Method for Neutron Diffusion Calculation

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Abstract : The distributions of homogeneous neutron flux within a node were expanded into a set of analytic basis functions which satisfy the diffusion equation at any point in a triangular-z node for each energy group, and nodes were coupled with each other with both the zero- and first-order partial neutron current moments across all the interfaces of the triangular prism at the same time. Based this method, a code TABFEN has been developed and applied to solve the neutron diffusion equation in a complicated geometry. In addition, after a series of numerical derivation, one can get the neutron adjoint diffusion equations in matrix form which is the same with the neutron diffusion equation; therefore, it can be solved by TABFEN, and the low-high scan strategy is adopted to improve the efficiency. Four benchmark problems are tested by this method to verify its feasibility, the results show good agreement with the references which demonstrates the efficiency and feasibility of this method.