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Determination of Optimum Parameters for Thermal Stress Distribution in Composite Plate Containing a Triangular Cutout by Optimization Method

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Abstract : Minimizing the stress concentration around triangular cutout in infinite perforated plates subjected to a uniform heat flux induces thermal stresses is an important consideration in engineering design. Furthermore, understanding the effective parameters on stress concentration and proper selection of these parameters enables the designer to achieve a reliable design. In the analysis of thermal stress, the effective parameters on stress distribution around cutout include fiber angle, flux angle, bluntness and rotation angle of the cutout for orthotropic materials. This paper was tried to examine effect of these parameters on thermal stress analysis of infinite perforated plates with central triangular cutout. In order to achieve the least amount of thermal stress around a triangular cutout using a novel swarm intelligence optimization technique called dragonfly optimizer that inspired by the life method and hunting behavior of dragonfly in nature. In this study, using the two-dimensional thermoelastic theory and based on the Likhnitskii' complex variable technique, the stress analysis of orthotropic infinite plate with a circular cutout under a uniform heat flux was developed to the plate containing a quasi-triangular cutout in thermal steady state condition. To achieve this goal, a conformal mapping function was used to map an infinite plate containing a quasi- triangular cutout into the outside of a unit circle. The plate is under uniform heat flux at infinity and Neumann boundary conditions and thermal-insulated condition at the edge of the cutout were considered.

Keywords : infinite perforated plate, complex variable method, thermal stress, optimization method
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