Thermal Stresses in a Hexagonal Region
With an Elliptic Hole

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Abstract: Considering importance of stress concentration around holes and notches of arbitrary shape in a given elastic medium for modern engineering, a two dimensional model for a thermoelastic problem in an hexagon region with an elliptic hole is established. The expressions for the temperature distribution and thermal stresses which have their importance in nuclear engineering are obtained for the model. The five elementary function’s method in plane thermoelasticity of multiply connected regions is used to obtain the solutions for temperature distribution and thermal stresses. Numerical calculations are computed assuming a central elliptic hole in the hexagonal region having thermally insulated outer boundary under uniform heat generation. The obtained results are depicted graphically.

Keywords: Temperature; thermal stress; Lame’s constants.

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1 Introduction

The investigation of stress concentration around holes and notches of arbitrary shape in a given elastic medium is very important for modern engineering. The high stress concentration found at the edge of a hole is of great importance. The heat generating cylinder with a hole are used in the construction of the reactor. The circular cylinder with a square hole is an applicable problem in the construction of support of the bridge. Polygon region with an elliptic hole have been used in nuclear reactor. As an example holes in ships deck may be mentioned. When the hull of a ship is bent, tension or compression is produced in the decks and there is a high stress concentration at the holes. Under the cycles of stress produced by waves, fatigue of the metal at the over