Abstract

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An Internal Penny-Shaped Crack Problem in an Infinite Thermoelastic Solid

A problem for an infinite thermoelastic solid weakened by an internal penny-shaped crack has been solved. The solid that is assumed to be homogeneous and isotropic is subjected to temperature and stress distributions. A cylindrical system of coordinates is used, in which the plane z = 0 is that of the crack and the z-axis is normal to it at the centre. In addition, the crack occupies the region that is subjected to prescribed temperature and stress distributions which vary with the radial distance r. The problem is solved using the Hankel transform. The boundary conditions of the problem give a set of two dual integral equations, which are solved analytically. The inversion of the transform is then obtained analytically. Numerical results for the temperature, stress and displacements distributions are shown graphically and then discussed. All the definite integrals involved were calculated using Romberg technique of numerical integration with the aid of a Fortran program compiled with Visual Fortran v.6.1 on a Pentium-IV pc with processor speed 2.0 GHz.