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Eigenvalue approach to coupled thermoelasticity in a rotating isotropic medium

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Abstract. In this paper the linear theory of the thermoelastic ity has been employed to study the effect of the rotation in a thermoelastic half-space containing heat source on the boundary of the half-space. It is assumed that the medium under consideration is traction free, homogeneous, isotropic, as well as without energy dissipation. The normal mode analysis has been applied in the basic equations of coupled thermoelasticity and finall the resulting equations are written in the form of a vector- matrix differential equation which is then solved by eigenvalue approach. Numerical results for the displacement components, stresses, and temperature are given and illustrated graphically. Comparison was made with the results obtained in the presence and absence of the rotation. The results indicate that the effect of rotation, non-dimensional thermal wave and time are very pronounced.

Keywords: Thermal stresses, Thermoelasticity, Eneregy dissipation, Rotation, Half-Space.

1. Introduction:

During the past few decades, widespread attention has been given to thermoelasticity theories that admit a finite speed for the propagation of thermal signals. In contrast to the conventional theories based on parabolic type heat equation, these theories are refered to as generalized theories. Because of the experimental evidence in support of the finiteness of the speed of propagation of a heat wave, generalized thermoelasticity theories are more realistic than conventional thermoelasticity theories in dealing with practical problems involving very short time intervals and high heat fluxes such as those occurring in laser units, energy channels, nuclear reactors, etc. The phenomenon of coupling between the thermomechanical behavior of materials and magnetic behavior of