ABSTRACT

The present work is to develop for the use of research workers in space technology, mechanical sciences and nuclear energy where certain components of the structure have to operate under the elevated temperature. The aim of present paper is to study the Free Vibration of Visco-Elastic Square Plate of Variable Thickness With Thermal Effect. The analysis presented here is to study the effect of thermal gradient on the vibration of visco-elastic square plate of variable thickness. Two dimensional thermal effects on frequency of free vibrations of a visco-elastic square plate is considered. It is also considered that the temperature varies linearly in both directions and thickness of square plate varies linearly in one direction and parabolic in other direction. We have taken the KELVIN model for visco-elasticity that is the combination of the elastic and the viscous element. It is considered that the plate have clamped boundary conditions on all the four edges. In this present work, a mathematical model is developed so that scientists and design engineers can make a use of it with a practical approach, for the welfare of the human beings. The frequencies corresponding to the first two modes of vibration of a clamped square plate has been computed for different values of thermal gradient and taper constant. The present work is
helpful in designing many scientific construction, where homogeneous structure are exposed to thermal due to which material properties undergo significant changes. Many numerical analyses are carried out to represent the accuracy and robustness of the proposed method by comparing the results to the works presented by other researchers. The major advantage of the present method over the existing ones is its simplicity for handling the problem of force vibration of tapered plates. Tapered plates are being increasingly used in modern engineering structures. These plates are generally used to model the structures.

An approximate but quite convenient frequency equation is derived for a square plate by using Rayleigh-Ritz technique with a two-term deflection function. Both the modes of the frequency are calculated by the latest computational technique, MATLAB, for the various values of taper parameters and temperature gradient. All the numeric calculation has been done for Duralium, an alloy of Aluminium. All the results are presented in the tabular as well as graphical form.

**Keyword:** Visco-elastic, Square plate, Thermal gradient, Taper constant, Parabolically, Variable thickness