Visco- Elastic Square plates are widely used in various mechanical structures, aircrafts and industries. For a proper design of plate structures and efficient use of material, the behavior and strength characteristics of plates should be accurately determined. A mathematical model is presented for the use of engineers, technocrats and research workers in space technology, mechanical Sciences have to operate under elevated temperatures. It is developed with an aim that scientists and design engineers can make a use of it with a practical approach.

Study of effect of vibration is of immense importance. They can’t be restricted only in the field of science but our day-to-day life is also affected by it. Whether it be a constructive aspect e.g. aircraft, space shuttle, satellite or design engineering to the destructive aspect, e.g. tsunami, earthquake etc., none of these are remained untouched with the effect of vibrations. Study of vibration responses of a square plate with thickness variation under the effect of temperature is of great importance for design officers, engineers and also to industry peoples, as visco-elastic plates may be regarded as an approximation to the wings, blades and variation in thickness may also lead to reduction in weight of structure.

Now a days, plates of variable thickness is one and two directions are used in a wide variety of applications, which serve two fold purpose i.e. safety and economy. The plates of variable thickness are being
mostly used in aerospace, nuclear, power plants, marine engineering, mechanical, civil, chemicals, ship hulls, building etc. It may also be used for construction of wings, tails and fins of the rockets and missiles. Therefore, this high intensity, heat fluxes for material properties undergo several significant changes. In the field of vibration of plates little work is done in the field of varying thickness in two directions and more research is going on presently.

The vibration of plates of various shapes homogeneous and non-homogeneous, orthotropic or isotropic with or without variation in thickness has been studied by lot of researchers without considering the effect of temperature.

In modern technology an interest towards the effect of high temperatures on non-homogeneous plates of variable thickness is developed due to applications in various engineering branches such as nuclear, power plants, aeronautical, chemical etc. where metals and their alloys exhibit visco-elastic behavior. Therefore for these changes the structures are exposed to high intensity, heat fluxes and material properties undergo significant changes. The reason for these is that during heating up periods, structures are exposed to high intensity heat fluxes and material properties undergo significant changes; in particular the thermal effect cannot be taken as negligible. Many analyses show that plate vibrations are based on non-homogeneity of materials. Non-homogeneity can be natural or artificial. Also, in the modern space technology, the need of the study of vibration of plates of certain aspect ratios with some simple
restraints on the boundaries has increased. The development of solid propellant rocket motors, increased use of soft filaments in aerospace structures and the building activities in the cold regions have intensified need for solutions of various problems of plates continuously supported by visco-elastic media. The information about first two modes of vibration is essential for construction engineer before finalizing a design.

Here, two dimensional thermal effects on frequency of free vibrations of a visco-elastic square plate are considered. It is also considered that the temperatures and thickness of square plate varies linearly in two directions. An approximate but quite convenient frequency equation is derived for a square plate (clamped at all the edges) 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 results are presented in the graphical and tabular form. All the material parameters used in numerical calculations have been taken for alloy ‘Duralium’.

**Keyword:** - Visco-Elastic, Square Plate, Vibration, Thermal Gradient, Taper Constant.