ABSTRACT

Structural members , commonly known as thin plates whose one dimension is small in comparison with other two dimensions are used in machine parts and the study of bending properties of such members is imperative to the structural design engineers.

The non linear analysis of plates of various shapes under different force constraints is growing significant interest to the design engineers owing to their use in various structures as well as in the aerospace vehicles. This non-linearity is generally studied in the classical literature from the principle of numerical techniques, finite element methods and the method of inductions.

The conception of boundary value problems have now changed to a revolutionary idea of constant deflection contour lines.

Following this concept of "Lines of equal deflections" the important works of different research workers who have analysed the static ,the dynamic or the thermal behaviours of thin plates are due to Mazumdar J. [1970,1971.1973,1974] ,Hewitt J.S. and Mazumdar J.[1974], Jones R., Mazumdar J. and Fu-Pen-Chiang [1975], Buceo D.,Mazumdar J. and Sved G.[1979]. All these investigations are based on the linear theory of thin plates. Prof. Banerjee has proposed a more advanced use of this constant deflection contour lines by efficient mathematical modelling of the describing differential equation of non-linearity of plates in a single equation both for movable and immovable edge conditions. But though Prof. Banerjee has opened a new line of modelling of the differential equation it has followed the existing classical method of induction as a solution of the deflection.

The most important shortcoming which an induction method possesses is the selection of the form of the deflection to suit a particular boundary value problem. There may be another difficulty

which arises for adopting the method of induction is the form of solution, which one had to be selected after a rigorous case study.

The present investigation deals with the new idea of solving such problems by generating the form of deflection with the help of computerised non-linear shooting method, very recent concept of modelling.

Hence the aim of the present investigation is two folded.

1) To generate a satisfactory describing differential equation of the case under study.

2)(a) To generate a suitable form of solution of the deflection through computerised simulation.

(b) To validate the generalised form of deflection with the existing known case studies .

The aim of the present investigation is to offer a noble approach for the non-linear analysis of thin elastic plates using the concept of constant deflection contour lines. Accuracy of the results obtained from the new investigation will be tested by comparing with other known results. The present investigation seems more advantageous than those obtained from other investigations, because

i) The results can be obtained from a single differential equation both for movable as well as for immovable edge conditions.

ii) A direct form of solution will be introduced which will definitely give us sufficiently accurate results for practical use.

iii) Computational labour is minimum.

As an illustration of the method developed some technically interesting examples would be examined.