SUMMARY

The work reported in this thesis includes several topics in the field of finite element analysis of arbitrary plates and shells.

The semiloof shell element is used throughout and, based on the semiloof shell theory, a plate element is derived and used in various applications throughout the thesis. Detailed matrix formulations of these elements are presented and their performance tested for a number of linear problems.

A finite element eigenvalue solution is developed and various structural eigenvalue problems are solved using both plate and shell elements. These include free vibration analysis, stability analysis and analysis of the vibrations of initially stressed shells. Results and comparison with other solutions are presented for a wide range of problems.

Using an incremental and iterative method a computer program is developed for the geometrically non-linear analysis of shells. Results are presented using the semiloof shell element and comparisons are made with other solutions.

Both semiloof plate and shell elements are used for materially non-linear analysis, comparisons being made with other solutions where available. The computer programs developed use the initial stress method as the method of solution.

Finally several types of analysis are performed on a large reinforced thin shell. These include linear and geometrically non-linear analysis as well as analysis of stability and free vibrations.
The influence on each analysis of changes in boundary conditions is studied and the various results compared and criticised.

For the various types of analysis considered throughout this work several convergence studies are presented.