

CHAPTER - 10

CONCLUSION

§ 10.1 Preliminary Remarks

In this brief section we like to put forward some critical remarks on the investigations together with a discussion on the scope of future work which may be in continuation of our study.

§ 10.2 Some Critical Remarks

Integral transforms are generally used for solving different types of boundary-value and initial-value problems. The method described in Chapter-1 of this thesis is found to be very convenient in deriving solutions of a class of boundary value problems of mathematical physics. In most of the transform techniques, the inversion presents much complication, that is why by using those transformations in problems only some approximate solutions can be obtained. But Cinelli's method, as reported is found to have the advantage in this respect. For, by this method exact solutions are easily derivable.

From Chapters 2 and 3 it is noticed that we can relate the transform parameter $\zeta$ of the newly introduced truncated Hankel transform to the eigen frequencies of the vibration under
study. Also in these chapters a broader law of variation of Young's modulus has been established in a class of problems of vibration of inhomogeneous elastic cylindrical and spherical shells, whereas so long in most of the recent investigations only the power law of elastic coefficients has been taken.

In chapter 4 an extension of Cinelli's method has been formulated. The method as presented in Chapter 1 is found to be applicable to the problems of physics involving second-order partial differential equations only, but in Continuum Mechanics most of the problems involve higher order differential equations, especially, the problems of coupled fields such as thermoelasticity, poroelasticity etc. From this point of view, the extended method established in chapter 4 of this text is seen to be of much importance.

In the sixth chapter, in solving problems of poroelasticity, it has been pointed out that from the physical point of view, the boundary conditions as taken by Jana and Sanayal (1971) are to be properly chosen.

In the third part of the thesis two interesting problems of hydromechanics have been solved by using well-known Laplace-transform technique. As stated earlier inversions of transforms as usual, have presented difficulties. To overcome these, short-time and long-time approximations have to be made. But some physical quantities as for example, the skin friction etc. can
reasily be calculated from the solutions, thus obtained. And here lies the importance of discussing the problem.

It is to be mentioned that from the results obtained in ninth chapter we have been able to find out the velocities of the different hydromagnetic waves which propagate when we consider the unsteady hydromagnetic flow generated in the fluid by the harmonic oscillation of a plate with a given frequency.

§ 10.3 Scope of Future Development

In chapters 2 and 3 only two problems of vibration of elastic shells, cylindrical and spherical have been studied by the method described in chapter 1. The theoretical problem of the vibration of spherical shells acquires great practical interest from the fact that an open shell is the best representation of a shell which admits of analytical treatment.

As stated before we have noticed that the transform parameter are found to be related with the eigen frequencies of the vibration. Analysis of the frequencies has not been made in those chapters. Study of different modes correspondingly the tones and overtones of the vibration can be made in future, so as to get proper picture of the vibratory motion of the shells.

Some other problems from elasticity can also be chosen to be solved by the method reported in the first part. In particular it is supposed that problems of elastic wave propagation
can conveniently be solved by this method.

The method introduced in the second part is applied to solve problems of thermoelasticity and poroelasticity only but this method can be well utilised for solving some other problems of coupled fields.

The theory of thermal stresses in homogeneous, isotropic bodies has been treated in detail in many scientific literature, the problems of thermal stresses in anisotropic bodies however have been dealt with, in only very few publications. But engineering structures contain materials of macroscopically anisotropic structures, the elastic and thermal properties for these materials are different in different directions. Problems can be so chosen so as to include these effects.

In chapter seven a very brief study has been made to characterize wave propagation and vibration mathematically but this needs more detailed discussion.

In the last two chapters two problems of hydromechanics have been studied. But it is to be noticed that these problems are not presented in their general forms. With introduction of some simplified assumptions about the velocity components, the non-linear terms have been vanished automatically. So the solutions in strict sense are not most general but only model ones. Hence one can study without making those simplified assumptions the most general solutions to get more clear picture of the flow phenomenon. This will present undoubtedly some complications
but can be left for future study.

In eighth chapter the problem has been solved as a boundary value problem, it would be interesting to consider the problem as an initial value problem for investigating the unsteady motion in detail.

In the ninth chapter the skin friction is calculated from the velocity distribution. The properties of skin friction can be studied in detail from the expression of $\tau$. 