CHAPTER-07

SUMMARY OF THE WORK, APPLICATIONS AND FUTURE SCOPE

7.1 Summary of the Present Work

The present thesis titled "**Analysis of Vibrations of Electro-Magneto Transversely Isotropic Thermoelastic Materials with Voids**" is the study of the vibration analysis of transversely isotropic, nonlocal thermoelastic cylinder/sphere with voids material under the impact of magnetic field.

The problems in this thesis has been modeled with the help of non-classical theories of thermoelasticity subjected to nonlocal elastic material under stress free/rigidly fixed thermally insulated and isothermal boundary conditions. The time harmonic variation technique has been used in transforming the governing equations and constitutive relations into ordinary differential equations. To create numerical data for graphical presentation, Iteration numerical technique has been applied to analytical results with the help of software tool MATLAB. Systems of linear equations have been solved by means of matrices method and crammers rule.

The numerical results for the effect of LS model of generalized magneto thermoelastic hollow cylinder have been shown for the field functions such as thermoelastic damping and frequency shift with and without magnetic field. The effect of magnetic field clearly indicates that the behavior of vibrations is larger in absence of magnetic field in contrast to presence of magnetic field. The natural frequency graphs clearly indicate that with increasing values of mode number, the behavior of vibrations keeps on increasing. In observing the behavior of figures, it is to be observed that after getting maximum and minimum amplitudes of variations, the behavior of thermoelastic damping becomes linear because of coupling between elastic and thermal fields. The analysis for electro-magneto transversely isotropic nonlocal generalized thermoelastic

hollow sphere with voids showed that in all the figures that the variation of vibrations is larger for DPL model of generalized thermoelasticity in contrast to other models because of the effect of relaxation time parameters. The effect of magnetic field clearly indicates that the variations are larger in absence of magnetic field in contrast to presence of magnetic field. The graphs representing natural frequencies clearly indicate that variation of vibrations go on increasing as the value of mode number increases.

With increasing values of mode number, it is observed that the behavior of thermoelastic damping becomes linear after achieving maximum amplitude, because of the coupling between elastic, voids equilibrated volume fraction and thermal fields. The frequency shift, damping and natural frequencies are influenced by non-locality effect and represented for nonlocal and local cases with and without magnetic fields. All the figures depict that the variation of vibrations has larger behavior in the TPL model of generalized thermoelasticity in contrast to DPL, LS and CTE cases because of effect of phase-lags of relaxation time parameters. The analysis of free vibrations of rigidly fixed boundary conditions under LS and GL model of generalized electro-magneto-thermoelastic nonlocal cylinder with voids material showed that the variation of vibrations is larger in case of GTE model in comparison to CTE and elasticity models. It is revealed that the thermoelastic damping vibrations go on decreasing to become linear.

7.2 Applications

The mathematical elasticity theory provides a rich skeleton to the study of various type of applications. From the results of the study, researchers receive the motivation to inspect the free vibration analysis of conducting elastic, thermoelastic and magneto-thermoelastic material with voids as novel applications in continuum mechanics, those who are working in the field of seismology for drilling and mining in the earth's crust. The study also find applications that physicists who are working in field of designing of new materials, free vibrations in material science, designers of new materials as well as in practical situations as in geomagnetic, optics, geophysics, acoustics, porous materials and oil prospecting etc. From literature study, it has been found that the TPL models provide better approach to allow voids and relaxation time parameters, which have many applications in the field of science, technology and engineering. The study might find

engineering applications in industry and defense that the theories of thermoelasticity i.e. TPL, DPL, LS. GL and CTE models provide better and easier description to allow voids diffusion and relaxation, where the processes of relaxation times are comparable.

7.3 Future Scope

The following suggestions are being made to researchers and scholars related to further study of vibration analysis, numerical computations and possible extension of this work. The present study can be further extended to vibration in two dimensions and then to three dimensions for material structure with shapes of sphere and cylinder using time harmonic variation technique for transforming the governing equations and constitutive relations into ordinary differential technique. The study can also further be extended to viscothermoelsastic shell type materials structures by employing matrix Frobenious method. Multilayered and composite material structures like sphere and cylinder can be investigated on the basis of present study. To check, test and validate the numerical results obtained using Homotopy techniques, finite difference method (FDM), boundary element method (BEM) and finite element method (FEM), the current study may act as bench mark for further study.