Abstract

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This thesis is includes by twelve chapters. The results in the chapters have been numbered as (4.3.1) means result number one of third article of chapter four. The references are given at the end of each chapter and quoted in the standard form that is [2] means second reference listed at the end of chapter, is referred

Chapter 1: This chapter includes the introductory remarks, the historical survey of thermoelasticity, some mathematical results required and necessary integral transform.

Chapter 2: This chapter concerned with an inverse transient thermoelastic problem in which we need to determine the unknown temperature, radial displacement and stress function on outer curve surface of a solid sphere when temperature is known at interior under consideration and initially is kept at zero. The governing heat conduction equation has been solved by using Laplace transform technique. The results are obtained in a series form of trigonometric functions. The results for temperature, radial displacement and stresses have been computed numerically and illustrated graphically
Chapter 3: This chapter presents the analytical results for temperature, radial displacement and stresses for the hollow sphere under the transient heating with known interior temperature. The general solution of the heat conduction equation for hollow sphere with interior boundary condition is derived by use of Laplace transform technique and the analytical solution is obtained. Numerical calculations are carried out for steel material and results for temperature, radial displacement and stresses are shown graphically.

Chapter 4: This chapter deals with the determination of unknown temperature and thermal deflection of thin circular plate with the stated conditions. The inverse heat conduction equation is solved by using finite Hankel transform and Laplace transform simultaneously and the results for unknown temperature and thermal deflection are obtained in terms of infinite series of Bessel’s function and it is solved for special case by using Math-cad software and illustrated graphically by using Origin software.

Chapter 5: This chapter consists of determination of unknown temperature and thermal deflection of thin circular plate with the stated conditions. The heat conduction equation is solved by using Marchi-Fasulo transform and the results for unknown temperature and thermal deflection are obtained in terms of infinite series of Bessel’s function and it is solved for special case by using Math-cad software and illustrated graphically by using Origin software.

Chapter 6: This chapter consists of determination of unknown temperature and thermal deflection of thin circular plate with the stated conditions. The inverse heat conduction equation is solved by using Marchi-Fasulo transform and the results for unknown temperature and thermal deflection are obtained in terms of infinite series of Bessel’s function and it is solved for special case by using Math-cad software and illustrated graphically by using Microsoft office Excel 2007.

Chapter 7: This chapter presents the work which deals with the determination of temperature, unknown heat flux, displacement and thermal stresses of thin annular disc with the stated conditions. The inverse transient heat conduction equation with stated conditions is solved by using Marchi-Zgrablich
transform and Laplace transform simultaneously and the results for temperature distribution, heat flux distribution, displacement and thermal stress functions are obtained in terms of infinite series of Bessel’s function and it is solved for special case by using Math-Cad 2007 software and presented graphically by using Origin software.

Chapter 8: The present chapter deals with the determination of temperature distribution and thermal deflection function of a thin circular plate with the stated conditions. The transient heat conduction equation is solved by using Marchi-Zgrablich transform and Laplace transform simultaneously and the results for temperature distribution and thermal deflection function are obtained in terms of infinite series of Bessel’s function and it is solved for special case by using Math-Cad 2007 software and represented graphically by using Microsoft office Excel 2007.

Chapter 9: This work concern with determination of two dimensional non homogenous temperature distribution , displacement distribution and quasi-static thermal stresses due to internal heat generation at the rate $g(r, z, t)$. The circular plate is considered with arbitrary initial temperature and subjected to time dependent heat flux at the outer circular boundary $r = a$. The upper surface ($z = h$) of the circular plate is insulated and the lower surface ($z = 0$) of the plate is at zero temperature for any time $t > 0$, heat is generated within this circular plate at the rate $g(r, z, t)$. The governing heat conduction equation has been solved by integral transform technique. The results are obtained in series form in terms of Bessel’s functions. The mathematical model has been constructed for copper material and the results for temperature, displacement and stresses have been computed numerically by using computational mathematical software MathCad 2007 and are depicted graphically by using Microsoft Office Excel 2007.

Chapter 10: This chapter consist of determination of quasi-static thermal stresses due to instantaneous point heat sours of strength $g_{ps}$ situated at certain circle along the radial direction of the annular disc and releasing it’s heat spontaneously at time $t = \tau$. A annular disc is considered with arbitrary initial
temperature and subjected to time dependent heat flux at the fixed circular boundary \( r = b \) and zero heat flux at the internal boundary \( r = a \). The governing heat conduction equation is solved by using the integral transform technique and result’s are obtained in series form in terms of Bessel’s functions. The mathematical model has been constructed for copper material and solved by using computational mathematical software Math-Cad 2007 and thermal stresses are discussed graphically using Origin software.

**Chapter 11:** The present work deals with transient thermoelastic problem of a semi infinite hollow cylinder to determine the temperature, displacement and thermal stresses with the stated conditions. The transient heat conduction equation with stated conditions is solved by using Marchi-Zgrablich transform and Fourier Sine transform simultaneously and the results for temperature distribution, heat flux distribution, displacement and thermal stress functions are obtained in terms of infinite series of Bessel’s function. These results solved for special case by using Math-Cad 2007 software and presented graphically by using Origin software.

**Chapter 12:** The present chapter describes the development of the application of generalized Thermoelastic Stress Analysis (TSA) of composite materials. Here we considered one-dimensional generalized thermoelastic mathematical model with variable thermal conductivity for heat conduction problem for a layered thin plate. The basic equations are transformed by Laplace integral transform method. The solution was applied to a plate of sandwich structure, which is thermally shock, and traction free in the outer sides. The inverses of Laplace transforms are obtained numerically. The results for temperature, stress and displacement distributions are depicted graphically.