



# CONTENTS

PREFACE. . . . .	vii
CHAPTER 1	
FOURIER TRANSFORMS . . . . .	1
Integral transforms. Fourier kernels. Fourier's integral theorem. Laplace transform. Foundations of operator calculus. Mellin transform. Multiple Fourier transforms	
CHAPTER 2	
HANKEL TRANSFORMS . . . . .	48
Hankel inversion theorem. Parseval's theorem for Hankel transforms. Hankel transforms of the derivatives of a function. Relation between Hankel transforms and Fourier transforms. Dual integral equations	
CHAPTER 3	
FINITE TRANSFORMS . . . . .	71
Finite Fourier transforms. Finite Hankel transforms	
CHAPTER 4	
THE THEORY OF VIBRATIONS. . . . .	92
Electrical oscillations in simple circuits. Transverse vibrations of a continuous string. Oscillations of a heavy chain. Transverse oscillations of an elastic beam. Transverse vibrations of a thin membrane. Vibrations of a thin elastic plate. Elastic vibrations of thick cylinders and spheres	
CHAPTER 5	
THE CONDUCTION OF HEAT IN SOLIDS. . . . .	159
General theory. Conduction of heat when there are no sources present. Two- and three-dimensional boundary value problems. Diffusion of heat in a solid medium which is generating heat	
CHAPTER 6	
THE SLOWING DOWN OF NEUTRONS IN MATTER. . . . .	206
Fundamental equations. Age theory. Diffusion of thermal neutrons with sources given by the age theory. Exact solutions of the transport equation	
CHAPTER 7	
HYDRODYNAMIC PROBLEMS . . . . .	267
Hydrodynamic equations. Irrotational flow of a perfect fluid. Surface waves. Slow motion of a viscous fluid. Motion of a viscous fluid contained between two infinite coaxial cylinders. Motion of a viscous fluid under a surface load. Harmonic analysis of nonlinear viscous flow	

CHAPTER 8

APPLICATIONS TO ATOMIC AND NUCLEAR PHYSICS . . . . . 327

Theory of radioactive transformations. Van der Waals attraction between spherical particles. Interaction of radiation with an electron. Cascade theory of cosmic ray showers. Distribution of momentum in atomic and molecular systems. Binding energies of the lightest nuclei

CHAPTER 9

TWO-DIMENSIONAL STRESS SYSTEMS . . . . . 395

Equations of motion. Infinite elastic solid with body forces. Application of pressure to the surfaces of a two-dimensional elastic solid. Distribution of stress due to a force in the interior of a semiinfinite elastic medium. Distribution of stress in the neighborhood of a Griffith crack. Indentation problems. Two-dimensional problems in polar coordinates. Dynamical problems

CHAPTER 10

AXIALLY SYMMETRICAL STRESS DISTRIBUTIONS . . . . . 450

Equations of equilibrium. Stresses produced by the indentation of the plane surface of a semiinfinite elastic medium by a rigid punch. Application of pressure to the faces of a thick plate. Distribution of stress in the neighborhood of a circular crack in an elastic body. Distribution of stress in a semiinfinite elastic medium due to a torsional displacement of the surface. Stress distribution in a long circular cylinder when a discontinuous pressure is applied to the curved surface.

APPENDIX A

SOME PROPERTIES OF BESSEL FUNCTIONS . . . . . 511

Bessel's differential equation. Recurrence relations for Bessel functions of the first kind. Definite integrals involving Bessel functions. Infinite integrals involving Bessel functions. Relation between the Bessel functions and circular functions. Integral expression for the Bessel function  $J_n(x)$

APPENDIX B

APPROXIMATE METHODS OF CALCULATING INTEGRAL TRANSFORMS. . . . . 516

Method of steepest descents for contour integrals. Numerical calculations of Fourier integrals

APPENDIX C

TABLES OF INTEGRAL TRANSFORMS . . . . . 522

Fourier transforms. Fourier cosine transforms. Fourier sine transforms. Laplace transforms. Mellin transforms. Hankel transforms. Finite Fourier cosine transforms. Finite Fourier sine transforms. Finite Hankel transforms

INDEX. . . . . 533

