

***Mechanical Impact Dynamics*, Raymond M. Brach, Wiley Interscience, 1991**
Revised Edition published by Brach Engineering, 2007

Table of Contents

Chapter 1. Principles, Assumptions and Definitions

- 1.1 Principles of Particle Dynamics
- 1.2 Simple Particle Impact
- 1.3 Comments and Discussion

Chapter 2. Point-Mass Collisions in a Plane

- 2.1 System Equations
- 2.2 Solution of System Equations
- 2.3 Special Properties of the System and Solution Equations
- 2.4 Tangential Restitution
- 2.5 Effect of External Impulses
- 2.6 Problems

Chapter 3. Restitution, Friction and Energy Loss

- 3.1 Introduction
- 3.2 Work of Impulses
- 3.3 Energy Loss During Impact: Friction and Restitution
- 3.4 Maximum Energy Loss: Critical Impulse Ratio
- 3.5 Deformation and Coefficient of Restitution
- 3.6 Nonlinear Oscillator Model
- 3.7 Summary of Equations for a Two-Particle Collision
- 3.8 Problems

Chapter 4. Three-Dimensional Particle Collisions

- 4.1 Energy Loss
- 4.2 Problems

Chapter 5. Planar Rigid Body Collisions

- 5.1 System Equations
- 5.2 Solution Equations
- 5.3 Solution Equations: Zero Moment Impulse
- 5.4 Energy Loss: Critical Impulse Ratio
- 5.5 Collision Accompanied by Shape Change
- 5.6 Summary Equations: Rigid Body Collision, Zero Moment Impulse, $e_m = -1$
- 5.7 Problems

Chapter 6. Planar Barrier Collisions

- 6.1 General System Equations
- 6.2 Tip Collision of a Slender Rod
- 6.3 Particle-Surface Collisions: Erosion and Wear
- 6.4 Tangential Restitution
- 6.5 Torsional Restitution
- 6.6 The Moment Coefficient
- 6.7 Problems

Chapter 7. Three-Dimensional Impact of Rigid Bodies

- 7.1 System Equations
- 7.2 Energy Loss
- 7.3 Example of a rigid Pendulum
- 7.4 Closure on Three-Dimensional Impact

Chapter 8. Planar Impact of Linkages and Articulated Rigid Bodies

- 8.1 System Equations for Impact of Two Multibody Systems
- 8.2 Impact of Manipulators
- 8.3 Impact of a Pair of Two-Member Body Chains: Impact of Articulated Vehicles
- 8.4 Problems

Chapter 9. Vibratory Impact

- 9.1 Periodic Point-Mass Impacts
- 9.2 Phase Plane
- 9.3 Point-Mass Vibratory Impact: Chaotic Motion
- 9.4 Mass-Spring Systems: Impact Dampers
- 9.5 Problems

Chapter 10. Application to Vehicle Collisions

- 10.1 Scene-Based Planar System Equations
- 10.2 Experimental Collision Data (RICSAC Data)
- 10.3 Least Squares Analysis
- 10.4 Empirical Equations for ΔV
- 10.5 Vehicular Accident Reconstruction
- 10.6 Impact of Light Aircraft with the Ground

Index