

CONTENTS

Preface	v
Chapter 1. Fundamentals	1
Section 1. Introduction	1
2. Kinematics of Simple Vibratory Motion	5
Chapter 2. Undamped Vibrations of Single-degree-of-freedom Systems	14
Section 3. Undamped Free Vibrations	14
4. Energy Method. Rayleigh Method	35
5. Undamped Forced Vibrations	44
6. Critical Speeds of Shafts	56
7. Suddenly Applied Forces	62
Chapter 3. Vibrations of Single-degree-of-freedom Systems with Viscous Damping	70
Section 8. Free Vibrations with Viscous Damping	70
9. Forced Vibrations with Viscous Damping	83
10. Vibration-measuring Instruments	101
11. Vibration Isolation	111
12. Power Consumption of Vibrating Systems	120
13. Transient Vibrations	125
Chapter 4. Systems of One Degree of Freedom with Nonviscous Damping	139
Section 14. Damping	139
15. Free Vibrations with Coulomb Damping	141
16. Forced Vibrations with Various Types of Damping. Equivalent Viscous Damping	144
Chapter 5. Undamped Vibrations of Systems with More than One Degree of Freedom	149
Section 17. Undamped Free Vibrations	149
18. Undamped Forced Vibrations	159
19. Balancing of Rigid Rotors by Means of Balancing Machines	163
20. Influence Coefficients	174
Chapter 6. Application of Generalized Coordinates	181
Section 21. Generalized Coordinates and Coordinate Coupling	181
22. Orthogonality of Natural Modes	192
23. Virtual Work and Generalized Forces	198
24. Lagrange's Equations	204

Chapter 7. Damped Vibrations of Systems with More than One Degree of Freedom	212
Section 25. Free Vibrations with Viscous Damping	212
26. Forced Vibrations with Viscous Damping	220
27. Balancing of Rigid Rotors with the Aid of Mathematical Analysis. Field Balancing	226
Chapter 8. Tabular Methods for Finding Natural Frequencies	237
Section 28. Longitudinal and Torsional Vibrations.	237
29. Bending Vibrations	239
30. Bending-vibration Modes of Propellers, Turbine Blades, and Rotating Wings	244
Answers to Problems	249
Index	259