

1. Record Nr.	UNINA9911006621603321
Autore	Newland D. E (David Edward)
Titolo	Mechanical vibration analysis and computation // D.E. Newland (professor of engineering, University of Cambridge)
Pubbl/distr/stampa	Mineola, New York : , : Dover Publications, Inc., , 2006
ISBN	9780486317724 0486317722 9781628703429 1628703423
Edizione	[1st ed.]
Descrizione fisica	1 online resource (1058 p.)
Disciplina	620.3
Soggetti	Vibració Vibration Civil & Environmental Engineering Engineering & Applied Sciences Civil Engineering
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record. "This Dover edition, first published in 2006, is an unabridged republication of the third impression (1994) of the work originally published in 1989 by Longman Scientific & Technical, Essex, England" -- Copyright page
Nota di contenuto	Cover; Title Page; Copyright Page; Contents; Preface; Disclaimer of warranty; Selected topics for a first course on vibration analysis and computation; Acknowledgements; Chapter 1: Fundamental concepts; General solution for one degree of freedom; Steady-state harmonic response; Expansion of the frequency-response function in partial fractions; Negative frequencies; Root locus diagram; Impulse response; Special case of repeated eigenvalues; Chapter 2: Frequency response of linear systems; General form of the frequency-response function; Example of vibration isolation Logarithmic and polar plots General expansion in partial fractions; Expansion for complex eigenvalues; Numerical examples; Example 2.1: Undamped response; Example 2.2: Undamped mode shapes; Example

2.3: Damped response; Example 2.4: Logarithmic and polar plots of the damped response; Partial-fraction expansion when there are repeated eigenvalues; Frequency response of composite systems; Natural frequencies of composite systems; Chapter 3: General response properties; Terminology; Properties of logarithmic response diagrams; Receptance graphs; Properties of the skeleton; Mobility graphs; Reciprocity relations; Measures of damping; Logarithmic decrement; Bandwidth; Energy dissipation; Modal energy; Proportional energy loss per cycle; Loss angle of a resilient element; Forced harmonic vibration with hysteretic damping; Numerical example; Time for resonant oscillations to build up; Acceleration through resonance; Chapter 4: Matrix analysis; First-order formulation of the equation of motion; Eigenvalues of the characteristic equation; Example 4.1: Finding the A-matrix and its eigenvalues; Example 4.2: Calculating eigenvalues; Eigenvectors; Normal coordinates; Example 4.3: Uncoupling the equations of motion; General solution for arbitrary excitation; Application to a single-degree-of-freedom system; Solution for the harmonic response; Comparison with the general expansion in partial fractions; Case of coupled second-order equations; Example 4.4: Transforming to  $n$ th-order form; Reduction of  $M$  second-order equations to  $2M$  first-order equations; General solution of  $M$  coupled second-order equations; Example 4.5: General response calculation; Chapter 5: Natural frequencies and mode shapes; Introduction; Conservative systems; Example calculations for undamped free vibration; Example 5.1: Systems with three degrees of freedom; Example 5.2: Bending vibrations of a tall chimney; Example 5.3: Torsional vibrations of a diesel-electric generator system; Non-conservative systems; Example calculations for damped free vibration; Example 5.4: Systems with three degrees of freedom; Interpretation of complex eigenvalues and eigenvectors; Example 5.5: Damped vibrations of a tall chimney; Example 5.6: Stability of a railway bogie; Checks on accuracy; Chapter 6: Singular and defective matrices; Singular mass matrix; Three-degree-of-freedom system with a singular mass matrix

---

## Sommario/riassunto

Focusing on applications rather than rigorous proofs, this volume is suitable for upper-level undergraduates and graduate students concerned with vibration problems. In addition, it serves as a practical handbook for performing vibration calculations. An introductory chapter on fundamental concepts is succeeded by explorations of frequency response of linear systems and general response properties, matrix analysis, natural frequencies and mode shapes, singular and defective matrices, and numerical methods for modal analysis. Additional topics include response functions and their applications, d

---