resonance conditions and the electrical analog circuit. No mention is made of the mobility concept.

Chapter 5 covers harmonic analysis and the transform technique in damped harmonic oscillator systems. In defining the Fourier analysis of a periodic function, the author applies it to a number of tractable periodic functions and truncated Fourier series. There is the best fit for a series of harmonics of a given periodic function based on a least square error. In defining the Fourier transform, the author proves that a continuous spectra of harmonic components can exhibit a shock in isolated shock pulse function. The basic theories of Laplace transform are derived and then employed in the solution of linear differential equations. Continuing, we encounter the applications to the study of impulse response, Dirac delta function, and derivation of the system transfer function. The chapter concludes with the employment of the convolution method in obtaining the system response to a rectangular shock force.

Chapter 6 focuses upon coupled harmonic oscillations. Two mechanical oscillators interact with each other and the system equations are derived by including a connecting spring member. The different modes of the coupled springs are derived based on the connections being either small or large and on changes in the displacements of the body and their interference pattern. Energy is important and is derived from the coupled system and the description of the resonances in the modes of the system.

Chapter 7 voices the aspect of non-discrete element mechanical vibratory systems. The chapter opens with a description of the oscillatory behavior of the mass/spring system when the spring possesses distributed mass. This leads to a compound pendulum with distributed mass. The next important subject is that of a vibrating spring subjected to a tensile force. The equations are derived and solved and the standing wave patterns are plotted. This progresses to the solid rod in transverse vibration; derivation and solution of the differential equation. The various end conditions are shown. The longitudinal vibration and wave equation of a solid rod are explained and demonstrated. A short description and derivation of the vibrating membrane is in order with the solution in Bessel functions. The chapter concludes with vibrations in an air column and electrical analog of distributed oscillations. This corresponds to the longitudinal vibration of a rod or a column.

Chapter 8 is usually found in books on instrumentation. It defines and describes piezoelectric effect and investigates the special features of longitudinal mechanical vibrations in piezoelectric crystals. The chapter opens with the basic (direct and reverse) aspects of the piezoelectric effect. The derivation of the piezoelectric relations between mechanical quantities (stress and strain) and the electrical quantities (field strength and dielectric displacement) are in order. A number of alternative pairs of independent simultaneous equations relating to the four quantities are derived. This includes the definitions and their respective relationships. The amazing aspects of a piezoelectric crystal is the ability to have electrical initial conditions and boundary conditions for a mechanical longitudinal wave in a rod. The chapter concludes by showing how a rod can function as a source of mechanical vibrations and also perform as a stress transducer.

The next chapter launches the concept of mechanical elements, i.e., springs and dampers which don't behave linearly. The characteristics of a non-linear spring and the free vibration of a mass/nonlinear spring is derived using Duffing's equations. Distinction is made between viscous damping and the hysteretic damping. The latter is used in describing the free vibration and response of a harmonic oscillator. The chapter ends with an interesting discussion of how static friction damping can affect the free oscillation of a system. This could cause a final error or offset. Proceeding along, Chapter 10 vividly furnishes a description of the electronic techniques used in detecting, measuring, and analyzing in a definitive manner, mechanical vibration. The opening section discusses why mechanical vibration is measured. This leads to a short section on the fatigue of metals and its appropriate S/H curve. This enters into the schematic diagram of a vibration transducer, signal processing (electrical), and the display and the further processing aspects. With this information under our belt, the analysis of periodic vibration is in order. As a natural consequence, the non-periodic, i.e., random vibration emerges into the spotlight. The Gaussian distribution, variance and its square root (standard deviation), autocorrelation function, and spectral density are derived and used in illustrative examples. The chapter concludes with the analysis of a shock or pulsed vibration. This requires the use of a high frequency accelerometer. No mention is made of cross correlation or cross spectral density.

Chapter 11 describes the procedures and means of reducing vibration in prime movers, isolating source of vibration from other fragile structures, and protecting devices from vibration in the environment. The opening section shows how eccentricities in rotors can cause vibration. This can prevent the transmission of vibrations to other vulnerable structures. A short description of the design of passive mountings to protect equipment from vibration is next on the agenda. The last section in this chapter describes the design of dynamic vibration absorbers in protecting structures from unwanted vibrations. The reviewer would have liked to see a more detailed account of vibration mounts, including how they are located, plus a discussion of active type vibration mounts.

The concluding chapter relates the effects of externally applied vibrations on a human body. Initially, the vibration sensors in the human body are commented upon. This includes the physiological and pathological responses to vibrations of the body. The latter is considered to be an array of mechanical oscillators. A need to protect the body from overexposure to vibration is a definite must. The author describes the significance of the ballistocardiogram and its analysis by spectral analysis. The chapter concludes with the origins and course of mechanical waves traveling along the arteries in the body, plus the use of medical diagnostic activity of these biological vibrations.

This is an excellent book. It should be expanded to cover a number of other topics, i.e., Rayleigh and Galerkin's methods, Lagrange and Hamilton equations, more detailed beam and plate analysis plus more detailed topics in data processing. The author explains in simple language the more complicated aspects of mechanical vibration. The proposed experiments at the end of each chapter are good. It tries to tie up the theoretical aspects with the practical happenings. The reviewer recommends this book to those desiring a knowledge of mechanical vibrations.


Reviewed by H. Saunders

A book bearing the name of S. P. Timoshenko, as an author or coauthor, is always a classic. Many of us were reared or studied one or more of Timoshenko's books. Reference is always made to them. The author has graciously revised the first edition, increased the number of topics, pages, problems and rearranged the contents for easier reading and understanding. The second edition has lost none of the charm.
and graciousness of the first edition. The book is colorful since it highlights the titles, various sections and subsections, and important equations in color. It is an easy-to-read book, profuse with a number of worked out examples. As stated by the authors, "This book covers all the standard types of mechanics of materials . . . In addition, much material of a more advanced and specialized nature is included. This book can serve as both a reference and a text."

It contains 12 chapters, a reference and a historical note section, and eight appendices plus an excellent list of symbols.

Chapter 1 discusses normal stress and strain. Included are diagrams, linear elasticity and Hooke's Law, shear stress and strain plus allowable stresses and loads. Chapter 2 covers a number of topics concerning axially loaded members. This includes deflection of axially loaded members, statically indeterminate members by stiffness and flexibility methods, temperature and prestrain effects, strain energy and stresses in inclined sections. The section on dynamic loading has been updated and made more cohesive and easy to understand. The topic of non-linear behavior has been centralized from the previous edition and acts as an introduction to one of the topics in a later chapter.

Chapter 3 reports on the general topic of torsion. This includes the torsion of circular bars, shear strain, relationship between E&G, transmission of power by circular shafts, strain energy in pure shear and torsion, non-linear torsion of circular bars plus torsion of thin walled tubes. The new topics are non-uniform torsion of varying cross section members plus statically indeterminate bars and composite bars in torsion. Chapter 4 is almost a mirror image of the first editions concerning topics of shear force and bending moments plus shear force and bending-moment diagrams.

Chapter 5, an important chapter, encases the subject of stresses in beams. It is almost a rubber stamp image of the previous edition. Topics considered are: (a) normal stress and strains in beams, (b) shear stresses in rectangular beams, webs of beams with flanges, (c) shear stress in built up and non-prismatic beams, (d) stresses in composite beams, (e) beams stress and bending plus axial loads. The section on combined bending and torsion and normal stresses is too short compared to the previous editions.

Chapter 7 details the deflections of beams. The topics in this chapter change very little from the previous edition. The introductory subject considers the solution of the differential equations of the deflection curve and its respective deflections by integrating the bending-moment and shear-force load equations. This leads to the important moment area and superposition methods. Additional topics include bending and shear of beams with eccentric axial loads plus practice problems applied to beams. The authors omit the section on finite differences applied to beams. The book "hits the spot." It is an elaboration of the first edition and made more cohesive and easy to understand. The topic of non-linear behavior has been centralized from the previous edition and acts as an introduction to one of the topics in a later chapter.

Chapter 9 is almost a rubber stamp image of the previous edition. The important subjects studied in detail are (a) doubly symmetric beam with skew loads, (b) pure bending of unsymmetric beams, (c) generalized theory of pure bending, (d) bending of beams by lateral loads; shear center, (e) shear stresses and shear center of thin-walled open sections, and (f) shear stress in beams bent about non-principal axes. Chapter 11 is an extension of the theory of columns from the previous edition. The authors report on the theory of buckling and stability, columns with end conditions, secant formula applied to columns, imperfection in columns and column design formulas. The subject columns with eccentric axial loads and different support conditions are new to this book. Another good chapter!

In conclusion, this is an excellent book. The authors fulfill their promise. It still possesses the favorable flavor and charm of the first edition. The reviewer would have preferred seeing a discussion of the plastic stress distribution due to the stress concentration about a circular hole.

Reviewed by H. Saunders


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Safety and reliability of structures assume roles of great importance with the recent earthquake events and nuclear power plant mishaps. Although a great deal of experimental and analytical endeavors have been performed, we are still far away from successfully evaluating the safety of existing structures. As stated by the author, "Much of the decision-making process depended upon each engineer's experience, intuition, and judgment. Several damage functions are summarized and reviewed along with current practice. Various system identification techniques in structural dynamics are also discussed in terms of their potential applications for the evaluation of structural safety." In interpreting and understanding the various findings concerning measurements, inspection, and analysis, one tries to come to a decision. This is in reference to