Mechanical Vibrations and Noise Engineering

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To
My grandson Chi. ISHAN
and
Granddaughters Chi. AYUSHI and Chi. ISHITA

through whose eyes I desire to peep into the future
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The subject of vibration deals with the oscillatory motions of bodies and the forces associated with them. Vibratory motions in machines and structures frequently occur in engineering applications. In fact, many significant failures of machines and structures in the past are attributed to severe vibrations to which they were subjected. It is always possible to anticipate vibration problem at the design stage itself. A design engineer, therefore, needs to be thoroughly exposed to the basic principles of vibration. The subject is thus important not only to mechanical and civil engineers but also to aeronautical engineers. With the introduction of predictive and diagnostic type of maintenance strategies, especially useful in process industries, periodic measurements of vibration and noise in machines have become all the more important. In preparing the manuscript of this book, the author has relied heavily on his class notes and classroom experience in this subject, spread over almost 30 years. The author also had in his mind, needs of the B.E. and B.Tech. students of Indian universities and those preparing for competitive examinations. Chapters 1–7 are devoted to cover various aspects of engineering vibration.

Noise is an obvious outcome of vibrations in machines and structural components. Any improvement in quality of city life calls for implementation of hearing conservation programme in the community, by way of increasing public awareness and also through enforcement of noise level regulations. In very near future, the engineers and executives working on the shop floors of industries will be required to maintain noise-exposure levels for industrial workers within permissible limits. An effective noise-control strategy to achieve this requires one to take into account the noise-emission levels of machines at the time of their purchase. The subject matter in this textbook is tailored to meet all such basic requirements of the students and budding engineers in noise engineering and is covered in Chapters 8–11.

With increase of size and speed of modern machines, vibration problems in structures and machines have assumed greater importance in all the three engineering disciplines. In view of fast rate of industrialization and also keeping in mind the rate at which increase in automotive vehicular population is taking place in this country, the author foresees an urgent need of stricter noise regulations and their effective enforcement to protect environment. A