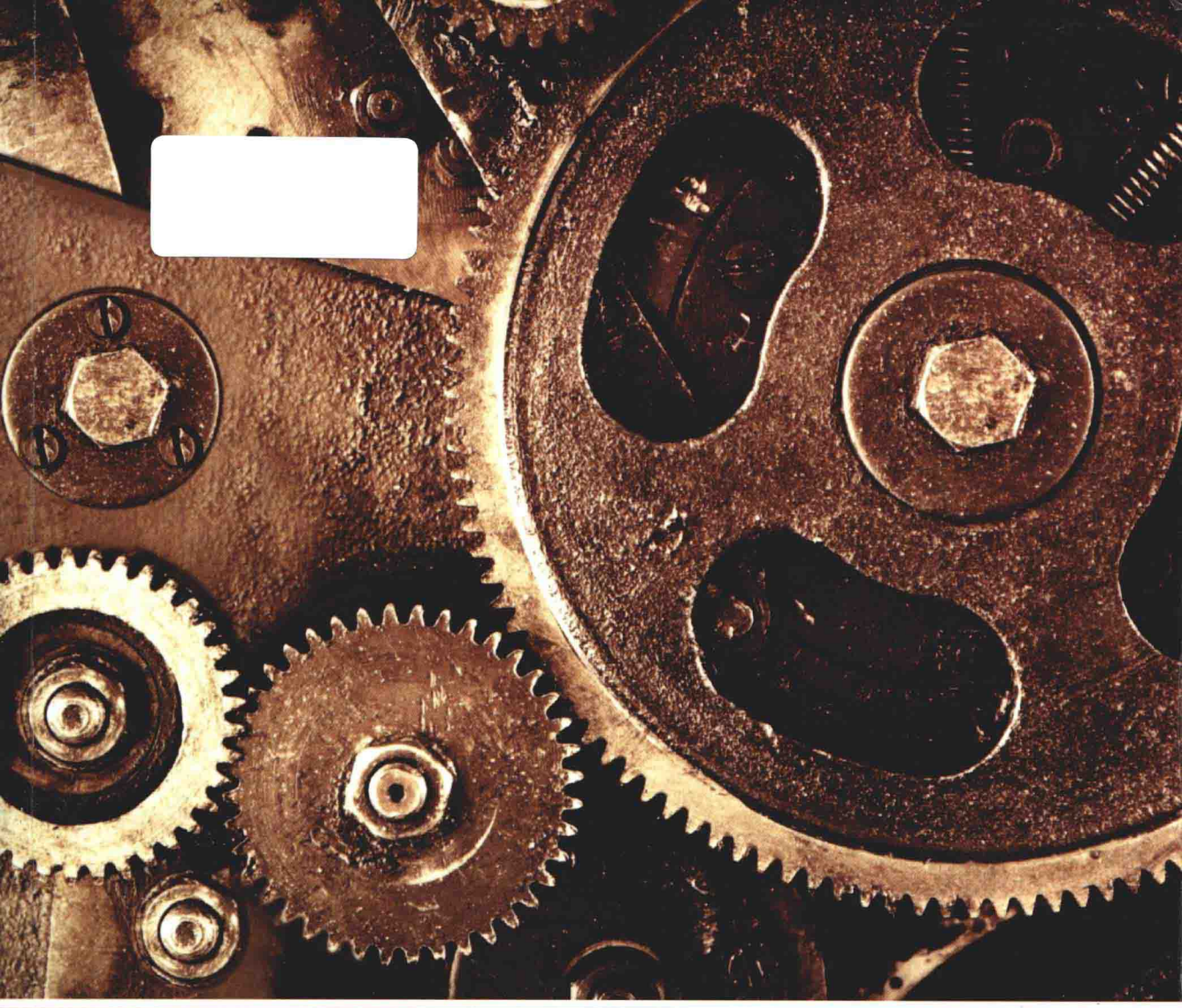

Analysis and Design of
MACHINE ELEMENTS

Second Edition

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Analysis and Design of Machine Elements

"The real challenge in engineering teaching is not getting through the syllabus with the students; it is getting the syllabus through to the students".

Dedicated to
Our Teachers and Parents

"The reader values a book more than the author does because the author knows that this is not the best and this could have been presented in a better way".

Preface to the Second Edition

We are thankful to the teachers and students who have wholeheartedly accepted the first edition of the present book. Keeping everything nearly same except correcting some typographic errors, two new chapters namely, "Pipe and Pipe Joints" and "Internal Combustion Engines" have been added in this present edition to make the book more comprehensive and useful to the students as well as the faculty.

Analysis and Design of Machine Elements is an attempt to offer the subject matter in most conceptual, concise, compact and lucid manner.

An obvious question that some students ask when they are first exposed to this course is *"how the problems of design are different from strength of material"*. This is explained in the very first chapter of the text. The steps used for classroom design problems are also explained separately. It specifically includes the right way of writing the SI units as per IS:10005-1985. The importance and use of other basic standard for preferred number IS: 1076- is also explained in brief.

Throughout the wide fields of engineering, the most fundamental requirement is a sound knowledge of the mechanics of materials coupled with an intimate understanding of the properties of materials. A brief account is given to materials and processes what minimum is required by a designer. A great emphasis is given to load and stress determination. Sufficient time and attention must be given to cover this chapter. It covers the loading and stress computation of all the machine elements discussed for design in later chapters.

It is very difficult to place the chapter of shaft design as it is the basic component of any machine and even for elements such as couplings, clutches, brakes, gears, pulleys, flywheels etc, it is to be discussed before these elements. But, the computation of loads on the shaft due to power transmitting components requires preliminary knowledge of the power transmitting components. In the current text, it has been discussed before the power transmitting elements and a load calculation for power transmitting elements has been explained.

As the students first encounter the design of cotter and knuckle joints, these have been explained in detail with 3D figure for better understanding of mode of failure and corresponding areas of failures. The cotter, knuckle joints and couplings problems have been solved using

empirical relations as well. The concept of preloading is elaborated in detail and proper design procedure is given to solve the screw fasteners design problems.

Temporary and permanent fasteners are discussed in subsequent chapters for eccentric loading also. Chapters 14 to Chapter 17 are dedicated for belts, chain and rope drives. Few very unique articles e.g. chain failure modes, lubrication of chain drive, timing belt pulleys, rope lay selection, wire rope manufacturing methods, effect of sheave size etc. are included.

All types of springs are discussed in Chapter 18. The design of clutches and brakes is explained in Chapter 19 and Chapter 20 respectively. Friction materials are discussed in detail for both wet and dry running with the relevant charts.

The gear fundamentals and gear design are given in two separate chapters and worm gear in a separate chapter. Chapters 24 and 25 are devoted to journal and rolling element bearings. Leavers and flywheel are discussed in Chapter 26 and Chapter 27 respectively.

Chapter 28 discusses pipe and pipe joints and chapter 29 deals with the parts of internal combustion engines.

We have been cautious and careful to eliminate all possible mistakes and errors. Still we may have not reached to the level of perfection in this voluminous work and some errors might have crept into. We shall appreciate the suggestions and comments for improvement of the book.

We wish to place on record our gratitude and indebtedness to Indian Standards Institution for the extracts of some of the Indian Standards included in this book. We are also thankful to the authors and publishers of various books consulted during the course of preparation this Design Data Book.

Finally, we thank the editorial and production staff of I.K. International, New Delhi for their continuous cooperation and help in publication of the book.

V K Jadon
Suresh Verma

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