This book provides a comprehensive collection of JEE problems and their solutions. We have kept our explanations simple so that any reader, with basic knowledge of intermediate physics, can understand them without any external assistance. Therefore, you can utilize it for self-study.

To us, every problem in this book, is a valuable resource to unravel a deeper understanding of the underlying physical concepts. The time required to solve a problem is immaterial as far as Physics is concerned. We believe that getting the correct answer is often not as important as the thinking process to arrive at it.

This book emphasizes the correct understanding of the principles of Physics and their application to find solution to problems. If a student attempts all the problems in this book seriously, he/she will naturally develop the ability to analyze and solve complex problems in a simple and logical manner using a few, well-understood principles.

Problem Selection

The book contains over 1200 problems in fluid mechanics, thermodynamics, oscillations, and waves. We included the problems from JEE Main, JEE Advanced, and standard books; a few are our creations.

IIT JEE (Advanced) has seen many changes over the years. The pattern of the paper and problem format has undergone significant changes. However, novelty, challenging nature, and potential to build a conceptual understanding of the problems remain invariant. We included all IIT JEE problems from 1978 to 2023.

JEE Main also saw many changes. The exam was initially conducted by CBSE (AIEEE: 2002–2012, JEE Main: 2013–2017), and now by NTA (2018 onwards). Initially, it used to be a single paper with 30 problems from physics. This scenario changed in the recent past. Now, NTA conducts it twice a year (January and April sessions). Each session offers the test on multiple dates (six). On each date, the test is conducted in two shifts — morning and evening. The paper in each shift contains 30 physics problems. Thus, they ask 720 physics problems, which is a large number. It is hard to create so many new and challenging problems year after year. Therefore, they pick many problems from books and earlier papers, with or without variation. This book includes all problems from 2002 to 2024; it does not repeat similar problems. It keeps useful variants and discards the cosmetic without losing anything valuable.

Physics is a mature subject with thousands of good problems in books like Problems in General Physics by I.E. Irodov etc. We selected problems from standard books and modified them as per JEE syllabus and format. In the process, we have also created a few new problems.

Organization

A well-organized book is more helpful to a reader.

We have organized the problems according to the textbook chapters. Some problems use concepts explained in multiple chapters of the textbook. These problems are placed in a later chapter so that you can solve them.

The topics are divided into 17 chapters. There are four chapters on properties of matter (elasticity and fluid mechanics), seven on thermal physics, two on oscillations and four on waves. A chapter should not have too many problems—a hundred problems is a good number.

Each chapter has four parts: key concepts, problems, answers, and solutions.

The *key concepts* give the concepts in brief. No explanation, no derivation. Our focus is on the application of concepts for problem-solving. Do not consider this book as a substitute for the textbook. It supplements standard textbooks like NCERT, H.C. Verma, or Resnick and Halliday, by providing additional problems for JEE.

The second part of each chapter contains *problems*. It is the core part, divided into multiple sections. Each section contains problems related to a concept or situation. The problems in each section are arranged in ascending order of difficulty. The year and exam in which a problem is asked is neither significant nor considered in this ordering. The order of ascending difficulty progressively builds problem-solving skills.

The problems involving multiple concepts are in *miscellaneous* section. The *exercise* sections contain useful variants of other problems. The problems in a chapter are numbered from 1 to N (last). This numbering scheme makes looking at the answer (or solution) easy.

The *answers* are given after listing all problems of a chapter.

The last part of each chapter is the *solutions*.

Special Symbols

Let's get acquainted with a few symbols. Problem number 59 looks like this:

59. ⋆† Young's modulus of elasticity Y is expressed in terms of three derived quantities, namely, the gravitational constant G, Planck's constant h and the speed of light c, as $Y = c^x h^y G^z$. The value of x, y and z are (2023 m:)

One (or more) symbol may follow the problem number. The meaning of these symbols are:

⋆ This problem is important because it involves a fundamental concept.

† This problem is difficult.

‡ This problem is even more difficult.

The problem's source is indicated by the *year* mentioned at the end of the problem. The format is:

(2023) IIT JEE (Advanced) 2023.

(2021 m) JEE Main 2021, **m** for main.

(2020 m:) JEE Main 2020 and also earlier **:**)

The year is absent in the problem derived from standard books.

There are multiple types of problems. A large number of them are MCQs with a single correct answer. MCQs with multiple correct answers have the phrase "one or more option(s) correct" at the end of the problem statement. A true or false type problem has True/False written at the end. A fill in the blank or numeric type problem has space ..... to be filled by the answer. A matching-type or matrix-type problem has columns to be matched. There are assertion reasoning type problems with *statement 1* and *statement 2*. A *paragraph* type problem has two or more related questions. And there are a few subjective problems too.

The problems are segregated based on concepts or situations, and not based on their types. We find this ordering more logical and efficient for learning.

Answers and Solutions

After solving a problem, cross-check your answer with the given answer. If it does not match, then return to the problem and identify your mistake(s). Control your temptation to see the solution until you are exhausted.

We made a sincere effort to come up with correct, clear, and better solutions. But these solutions shall not be seen without giving a sincere try. Solve the problems yourself. It will help you identify the critical points in the problems, which will accelerate the learning process. Take time and make sincere efforts to solve. If you are unable to solve, re-read the concepts from your textbook, paying attention to the finer points. Reading the theory with a definite goal in mind is very effective. It leads to success when the problem is re-tried. If you exhaust all options, read the solution.

If you fail to solve a problem, your conceptual understanding or problem-solving skills need enhancement. Our detailed and clear solutions will help you in this situation. No tricks or shortcuts. Read the solution carefully till the end. You will find valuable extensions or key points at the end of many solutions. They will open new dimensions for you to think about.

The problems in the *exercise* sections are a variant of other problems. The solutions to these problems contain a hint or a reference to the original solved problem.

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Jitender Singh, jsinghdrdo@gmail.com
S. Chaturvedi, shraddhesh8@gmail.com