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HEAT AND THERMODYNAMICS

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HEAT AND THERMODYNAMICS

[For B.Sc. (Pass, General Subsidiary), B.Sc. (Hons. and Engineering) and Medical and Engineering colleges Entrance, IAS Examinations]

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PREFACE TO THE FIRST EDITION

This book on "Heat and Thermodynamics" is primarily intended for students preparing for degree examinations of Indian Universities.

The subject matter is divided into eight chapters. Much of the elementary material with which the students are already familiar at the higher secondary level is not included. The material is presented in a comprehensive way and the sequence of articles in each chapter enables the students to understand the development of the subject.

The chapter on thermodynamics includes a large number of topics *viz*, zeroth law of thermodynamics, concept of heat, problems concerning entropy, Maxwell's thermodynamical relations, the first, the second and the third laws of thermodynamics, practical working of heat engines, refrigerators and the concept of negative temperatures. Based on the syllabus for degree classes of different universities, equal emphasis is also given to chapters concerning thermometry, specific heat, kinetic theory, liquefaction of gases, production of low temperatures, pyrometry and transmission of heat.

A large number of diagrams to illustrate the basic principles are given in the book. Solved numercial examples are also given at the end of each chapter to enable the students to apply the formulae and principles studied. The exercises at the end of each chapter contain a large number of questions including numerical problems and these are mainly selected from question papers of different Universities.

We are greatly indebted to Prof. Y.V.S.R. Sastry, M.E., Ph.D., Professor of Mechanical Engineering, Delhi College of Engineering, Delhi, for his valuable help in reading and suggesting improvements in the chapter on thermodynamics. We are also thankful to Mr. Raj Kumar Seth, Sales Manager and P.N. Kapoor for the interest they took in getting the book published.

We hope that this book will be found useful by the students and teachers in the various institutions in India. We will appreciate any suggestions for the improvement of the book.

DELHI
March, 1, 1968.

BRIJ LAL
N. SUBRAHMANYAM

PREFACE TO THE SIXTEENTH EDITION

The present edition of the book has been revised. A new Chapter on Statistical Thermodynamics is included in this edition. This chapter deals with Statistical Equilibrium, Maxwell Boltzmann Distribution, Fermi-Dirac Distribution and Bose-Einstein Distribution. The statistical behaviour of an ideal gas, an electron gas and a photon gas has also been discussed and the comparison of the three statistics is discussed.

The whole chapter on thermodynamics is thoroughly reoriented. The following new topics have been added :

1. Richardson's equation 2. Reversible and irreversible processes. 3. Gibb's function. 4. Helmholtz function. 5. Enthalpy. 6. First order phase transitions. 7. Second order phase transitions. 8. Theory of adiabatic demagnetisation. 9. Maxwell's thermo-dynamical relations. 10. Properties of matter near critical point. 11. *T-ds* equation. 12. Heat and Work as path functions. 13. Quasi-static process. 14. Gibb's phase rule. 15. Joule-Kelvin coefficient. 16. C_p, C_v and μ.

A few new topics have been included in the Appendix at the end of the book.

Temperatures on the thermodynamic scale are denoted as *T* and the unit used is Kelvin (Symbol K). It may be noted that the symbol in SI units is K and not °K.

The exercises at the end of each chapter are brought up-to-date and questions from recent university papers have been added. We are grateful to the students and teachers for the favourable response given to the book. Suggestions for further improvement of the book will be highly appreciated. Our grateful thanks are due to Shri R.K. Gupta for printing the book in time.

BRIJ LAL

N. SUBRAHMANYAM

DELHI

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