**B.Sc.-II(Physics)**
**Semester-III**

**Physics- PH-301**

**Paper V: Computer Programming and Thermodynamics**

**Max. Marks: 40**

**Internal Assessment: 10**

**Time: 3 Hours**

**Note:**

1. The syllabus is divided into 4 units. 9 questions will be set.

2. Question no 1 will be compulsory, it contains 6 parts (form all the four units) and answer should be brief but not in yes / no.

3. Four more questions are to be attempted, selecting one question from each unit. Questions 2-9 may contain two or more parts. All questions carry equal marks

4. 20% numerical problems are to be set.

5. Use of scientific (non-programmable) calculator is allowed.

**UNIT-1: Computer Programming**

Computer organization, Binary representation, Algorithm development, Flow charts and their interpretation. FORTRAN Preliminaries: Integer and floating point arithmetic expression, built in functions, executable and non-executable statements, input and output statements, Formats, IF, DO and GO TO statements, Dimension arrays, statement function and function subprogram.

**UNIT –2: Applications of FORTRAN programming**

Algorithm, Flow Chart and Programming for Print out of natural numbers, Range of the set of given numbers, Ascending and descending order, Mean and standard deviation, Least square fitting of curve, Roots of quadratic equation, Product of two matrices, Numerical integration (Trapezoidal rule and Simpson 1/3 rule) .

**UNIT-3: Thermodynamics-I**

Thermodynamic system and Zeroth law of thermodynamics. First law of thermodynamics and its limitations, reversible and irreversible process. Second law of thermodynamics and its significance, Carnot theorem, Absolute scale of temperature, Absolute Zero and magnitude of each division on work scale and perfect gas scale, Joule's free expansion, , Joule Thomson effect, Joule-Thomson (Porous plug) experiment, conclusions and explanation, analytical treatment of Joule Thomson effect. Entropy, calculations of entropy of reversible and irreversible process , T-S diagram, entropy of a perfect gas, Nernst heat law(third law of thermodynamics), Liquefaction of gases, (oxygen, air, hydrogen and helium), Solidification of He below 4K, Cooling by adiabatic demagnetization.

**UNIT-4: Thermodynamics-II**

Derivation of Clausius-Clapeyron and Clausius latent heat equation and their significance,specific heat of saturated vapours,phase diagrame and triple point of a substance, development of Maxwell thermodynamical relations. Thermodynamical functions: Internal energy (U), Helmholtz function (F), Enthalpy (H), Gibbs function (G) and the relations between them, derivation of Maxwell thermodynamical relations from thermodynamical functions,Application of Maxwell relations: relations between two specific heats of gas, Derivation of Clausius-Clapeyron and Clausius equation,variation of intrinsic energy with volume for (i) perfect gas (ii)Vanderwall gas (iii)solids and liquids , derivation of Stefans law, adiabatic compression and expention of gas & deduction of theory of Joule Thomson effect.

**References:**


1 Ian C and Malcon C, Interactive FORTRAN 77, Affiliated East West Press Pvt Ltd, New Delhi

2 Rajaraman V, Computer Programming in FORTRAN 77, Prentice-Hall of India Pvt Ltd, New Delhi.

3 Suresh C, Computer Applications in Physics, Narosa ublishing House, New Delhi 4 Roy S K, Thermal Physics and Statistical Mechanics, New Age International

Publishers, New Delhi

5 Sharma J K and Sarkar K K, Thermodynamics and Statistical Physics, Himalaya Publishing House, Bambay

6 Stowe Keith, Introduction to Thermodynamics and its Applications, University press (India) Pvt Ltd, Hyderabad

7 Infelta Pierre P. Introductory Thermodynamics Publisher: BrownWalker Press

8 Johnson J. K, Fundamentals of Thermodynamics University of Pittsburgh 2009

9 Jefferson Tester, Michael Modell, Thermodynamics and Its Applications 3rd Edition 10 Thomas Engel, Philip Reid, Thermodynamics, Statistical Thermodynamics, &

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