SEMESTER - IV

Paper - I : Material Science - II

Max. Marks: 55
Time: 3 Hrs

Note: Nine questions will be set and students will attempt 5 questions. Question No. 1 will be compulsory consisting of 4 parts based on the conceptual aspects of the whole syllabus. The answers should not be in yes/no. In addition to Question No. 1 there will be four Units in the question-paper each containing two questions belonging to four Units in the syllabus. Students will select one question from each unit.

UNIT - I

Superconductivity: Occurrence of superconductivity, conventional super conductors, Meissner effect.
Properties of Superconductors : Heat capacity, Infrared properties, Isotope effect, energy gap in super conductors, Thermodynamics of superconducting transition, The attraction between electrons, cooper pairs, Type I and II Super conductors, London equation, Flux quantization.

UNIT - II

Properties of superconductors: Qualitative discussion of BCS Theory, Coherence length, Duration of persistent Current, DC and AC Josephon Effects. Single Particle Tunneling, Josephon Tunneling. Macroscopic Quantum interference.
High Temperature Super Conductors: High temperature oxide super conductors, discovery and properties, chemical aspects and structure of La-Ba-Cu-O, Y-Ba-Cu-O, Bismuth and thallium based superconductors.

UNIT - III

Polymers And Ceramics : Polymers, Polymerization, Molecular weight and molecular weight distribution, Thermosets and thermoplasts, Amorphous and crystallic polymers, response of polymers to stress over a temperature range, Rigid, Viscoelastic and rubbery regions.

UNIT - IV

Mechanical models for behaviour of polymers, Maxwell and Kelvin elements, Mechanical analog to the behaviour of polymers, Introduction to Engineering and conducting polymers.
Ceramics : Introduction to physical and mechanical properties of ceramics, Traditional ceramics, cement and concrete, New ceramics.

References

1. Metal, ceramics and polymers - O.H. Wyatt and D.D. Hughes.
2. Textbook of Polymers Science - Fred W. Billmeyer, JR.
3. Foundation of material science and engineering - William F. Smith.
4. Introduction to solid state physics - C. Kittel