DAH-003-0494005 Seat No. _____

B. Sc. / M. Sc. (Applied Physics) (Sem. IV) (CBCS) Examination

April - 2022

Paper - XV : Fundamentals of Materials Science

(New Course)

Faculty Code : 003

Subject Code : 0494005

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All questions are compulsory.

(2) Numbers in the right margin indicate marks.

1 Attempt any **SEVEN** short questions : **14**

(1) Give the difference between materials science and materials engineering.

(2) What are different types of bonding in solids?

(3) Define the terms : Gibbs free energy and Enthalpy.

(4) Define triple point of water.

(5) Explain solubility limit using sugar-water system example.

(6) Define Nucleation and Growth in phase transformation.

(7) Discuss the heat treatment of glasses.

(8) What is meant by phase transformation?

(9) Classify various ceramic materials based on their applications.

(10) Define homogenous nucleation.

2 (A) Write answers of any **TWO** : **10**

(1) Describe various types and their applications of advanced Materials. Give suitable examples.

(2) Discuss basic thermodynamic functions using the concept of equilibrium and kinetics.

(3) Explain the formation of Ionic, Covalent, Metallic and Secondary Bonds in solids.

(4) Explain in detail the concept of Stability and Metastability.

(B) Write answer of any **ONE** : **4**

(1) Depending on the level of structure, classify the structure of the materials.

(2) Draw a unary-phased diagram and describe its salient features.

3 (A) Write answers of any **TWO** : **10**

(1) Describe binary eutectic system using Cu-Ag phase diagram.

(2) Discuss the development of microstructure in isomorphous Cu-Ni alloy under equilibrium cooling.

(3) Draw a well-labelled phase diagram of Cu-Ni binary alloy system. Describe its salient features.

(4) Write a detailed note on the interpretation of a phase diagram.

(B) Write answer of any **ONE** : **4**

(1) Explain the concept of nucleation and growth with suitable diagram.

(2) Discuss the effect of Recrystallization and grain growth of the material.

4 (A) Write answers of any **TWO** : **10**

(1) Explain in detail the precipitation process using the example of Al-Cu phase diagram.

(2) Write a note: Time scale for phase changes.

(3) Using LEVER RULE determine the relative phase amounts (mass fraction) in two phase region of Pb-Sn phase diagram.

(4) Discuss the development of microstructure in isomorphous Cu-Ni alloy under nonequilibrium cooling.

(B) Write answer of any **ONE** : **4**

(1) Write a note: Solidification and Crystallization.

(2) Explain LEVER RULE for the determination of phase fraction and phase percentage in binary system.

5 (A) Write answers of any **TWO** : **10**

(1) Classify the ceramics based on their applications. Describe the Refractories and Abrasives.

(2) Describe various types of advanced ceramics with suitable examples and their applications.

(3) Describe the Glass transition phenomenon.

(4) Describe the heat treatment of glass ceramic.

(B) Write answer of any **ONE** : **4**

(1) Write a detailed note on Portland cement.

(2) Write down the properties and applications of Glass ceramic.
