



MBU-003-0494005 Seat No. _____

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

April / May - 2018

**Fundamentals of Materials Science : Paper - XV
(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) Define Solidus line & Liquidus line.
 - (2) Define Solid Solubility & Phase equilibrium.
 - (3) What are different type of bonding in solids?
 - (4) Define triple point of water.
 - (5) What are the empirical laws of recrystallization.
 - (6) What is meant by phase transformation?
 - (7) Discuss the heat treatment of glasses.
 - (8) Draw a phase diagram for $MgO - Al_2O_3$
 - (9) Classify various ceramic materials on the basis of their applications
 - (10) What are MEMS?
- 2** (A) Write answers of Any **Two** : **10**
- (1) Explain in detail the concept of Stability and metastability.
 - (2) Describe various types and their applications of advanced Materials. Give suitable examples.

- (3) Explain the formation of Ionic, Covalent, Metallic and Secondary Bonds in solids.
- (4) Explain phase diagram of Cu-Ag binary eutectic system.
- (B) Write answer of Any **One** : **4**
- (1) What are different Material ages? Describe smart materials.
- (2) Write a note on Materials useful for mankind. What are biomaterials?
- 3** (A) Write answers of Any **Two** : **10**
- (1) Discuss the development of microstructure in isomorphous Cu-Ni alloy under equilibrium cooling.
- (2) Write a detailed note on the interpretation of a phase diagram.
- (3) Draw a unary phased diagram and describe its salient features.
- (4) Explain LEVER RULE for the determination of phase fraction and phase percentage in binary system.
- (B) Write answer of Any **One** : **4**
- (1) Draw a well labelled phase diagram of Cu-Ni binary alloy system. Describe its salient features.
- (2) Using LEVER RULE determine the phase amounts (fraction & percentage) in two phase region of Cu-Ni phase diagram.
- 4** (A) Write answers of Any **Two** : **10**
- (1) Explain the concept of nucleation & growth with suitable diagrams.
- (2) Explain: Solidification and crystallization.
- (3) What is grain growth? Explain using figure, how the physical properties change during grain growth?
- (4) Describe the Glass transition phenomenon in detail.

- (B) Write answer of Any **One** : 4
- (1) Write a note: Heterogeneous nucleation
 - (2) Write a note: Time scale for phase changes
- 5** (A) Write answers of Any **Two** : **10**
- (1) Draw a well labelled phase diagram of $Al_2O_3 - Cr_2O_3$ and explain various features.
 - (2) Explain specific volume vs. temperature behaviour of non-crystalline and crystalline glass materials.
 - (3) What is fractography? Explain fractography in detail for ceramic materials.
 - (4) Describe various types of advanced ceramics with suitable examples and their applications.
- (B) Write answer of Any **One** : 4
- (1) Describe the influence of porosity on the modulus of elasticity of ceramic materials
 - (2) Explain the stress-strain behaviour of ceramic materials
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