Hall Ticket No | | | | | | | | | | | Question Paper Code: AME005

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech III Semester End Examinations (Regular) - December, 2017

Regulation: IARE – R16

MATALLURGY AND MATERIAL SCIENCE

(Mechanical Engineering)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Draw a neat sketch of Body Centered Cubic Structure and Calculate its Atomic Packing Factor. **[7M]**

   (b) Discuss the effect of grain size on properties of metals and alloys. **[7M]**

2. (a) Describe the necessity of alloying for getting various metal alloys. Also discuss the effect of various alloying elements on the properties of the steel. **[8M]**

   (b) Write a short notes on intermediate alloy phases. **[6M]**

UNIT – II

3. (a) Draw and explain the cooling curves for **[7M]**
      i. Pure Metal
      ii. Eutectic Type Alloys

   (b) From the given data below for Bi-Cd system, plot the equilibrium diagram to scale and find
      i. Amount of eutectic in 20 % Cd alloy **[7M]**
      ii. Free cadmium in 70 % Cd alloy
      Given Melting temperature of Bi =271°C
      Melting temperature of Cd = 321°C
      Eutectic temperature = 144°C
      Eutectic composition = 39.7% Cd

4. (a) State and explain the lever rule for determination of composition in the phase diagram with examples. **[7M]**

   (b) Explain with neat sketch eutectoid phase diagram with examples. **[7M]**

UNIT – III

5. (a) Discuss the objectives of the annealing heat treatment. **[4M]**

   (b) Draw a neat sketch of Iron-carbon equilibrium diagram and label the areas. Describe the mode of solidification, solid state reactions and microstructure at room temperature of a slowly cooled steel of carbon content 1.2%. **[10M]**

6. (a) Define Hardenability? Describe the Jominy end-quench test of determining hardenability. **[8M]**
   (b) Distinguish clearly between Austempering and Martempering treatment. **[6M]**

UNIT – IV

7. (a) Discuss the composition, properties and uses of brasses. **[6M]**
   (b) Compare gray cast iron and SG iron with respect to composition, structure, properties and uses. **[8M]**
8. (a) Explain the composition, properties and applications of Al-Cu alloy. **[6M]**
   (b) Describe the types, properties and uses of titanium and its alloys. **[8M]**

UNIT – V

9. (a) Describe the classification of ceramic materials. **[7M]**
   (b) Discuss the effect of the following factors on mechanical behaviour of ceramic materials. **[7M]**
      i. Grain size and shape
      ii. Purity
      iii. Porosity
10. (a) What are composites? Describe briefly the classifications of composite materials. **[8M]**
   (b) Explain the properties, applications of Fibre reinforced plastics. **[6M]**

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