Code No: RT21031 **R13** SET - 1

**II B. Tech I Semester Regular Examinations, Dec - 2014**
**METALLURGY AND MATERIAL SCIENCE**
(Com. to ME, AME)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

## PART-A

1. a) Differentiate between solvus line and solidus line?
   b) What is critical cooling rate?
   c) Why are metals mostly ductile and ceramics brittle at room temperature?
   d) What is coring?
   e) What is an Isomorphous system? Give an example?
   f) Briefly classify the composite materials
   g) Explain about Ionic bond?
   h) Give properties of nanomaterials? (3M+3M+3M+3M+3M+3M+2M+2M)

## PART-B

2. a) Explain about the necessity of alloying. Why alloys are more preferred over metals, for industrial applications?
   b) Name Hume-Rothery's rules and explain all of them. (8M+8M)

3. a) What is plain carbon steel? Explain the transformation of eutectoid steel with slow cooling?
   b) Write the three invariant reactions in Fe-$Fe_3C$ phase diagram? (8M+8M)

4. a) Write the characteristics, compositions and applications of malleable cast irons and S.G. Cast iron
   b) Explain the properties and applications of the following? (8M+8M)
   i) Low carbon steel ii) High carbon steel

5. a) Schematically illustrate the quenching and tempering process of plain carbon steel.
   b) Explain the various stages in a heat treatment cycle. (8M+8M)

6. a) Define Bronze? What are the types of bronzes? Explain the properties and application of any two of them?
   b) Give the properties and classification of titanium alloys? (8M+8M)

7. a) Explain how the composite materials differ from metallic alloys. Explain with examples.
   b) What are ceramic materials? Name some of the important ceramic materials. Give their properties and important industrial applications. (8M+8M)



|''|'||||''|''|'|'|
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: RT21031 **R13** SET - 2

**II B. Tech I Semester Regular Examinations, Dec - 2014**
**METALLURGY AND MATERIAL SCIENCE**
(Com. to ME, AME)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

## PART-A

1. a) What is the difference between alpha iron and ferrite?
   b) What is tempering?
   c) Why are fiber glass reinforced composites used extensively?
   d) What are solid solutions?
   e) What are composite materials
   f) Write application of materials?
   g) Write the composition and properties of Gun metal?
   h) Write the composition and properties of tool steels? (3M+3M+3M+3M+3M+3M+2M+2M)

## PART-B

2. a) Which is the most important of the Hume Ruthery rules? Explain it with suitable example?
   b) What is difference between random and ordered Solid Solutions? (8M+8M)

3. a) Write the eutectoid reaction in Fe-$Fe_3C$ system and find the amount of different phases at the eutectoid point
   b) Draw the phase diagram of Al-Cu system? Label all the points and phases? Explain the eutectic reaction taking place in this phase diagram? (8M+8M)

4. a) Explain the different kinds of carbon steels. Explain them. Also give their carbon contents
   b) Differentiate between gray cast iron and white cast iron? (8M+8M)

5. a) Define hardening? What are its objectives?
   b) Steel is made hard by quenching. List, at least, three requirements that must be met to justify this statement. (8M+8M)

6. a) Give the properties of Aluminium, copper and Titanium?
   b) Define Brass? What are the types of brasses? Explain the properties and application of any two of them? (8M+8M)

7. a) Discuss the mechanical and thermal properties of ceramics.
   b) Write a detailed note on classification of ceramics. Also discuss about traditional ceramics & fine ceramics. (8M+8M)
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: RT21031 **R13** SET - 3

**II B. Tech I Semester Regular Examinations, Dec - 2014**
**METALLURGY AND MATERIAL SCIENCE**
(Com. to ME, AME)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

## PART-A

1. a) What is hardenability?
   b) Why brass is always stronger than copper at room temperature?
   c) Explain lever rule?
   d) What is E-glass?
   e) Give the allotropy forms of iron?
   f) Explain about the covalent bond?
   g) What is full annealing?
   h) Give the classification of steels? (3M+3M+3M+3M+3M+3M+2M+2M)

## PART-B

2. a) What is an interstitial solid solution name the five elements which commonly form interstitial solid solutions?
   b) What is a grain size? What is a fine grained and coarse grained material? (8M+8M)

3. a) Construct the Isomorphous system with the help of cooling curves?
   b) Determine the pro-eutectoid ferrite, eutectoid ferrite and eutectoid cementite of 0.6 wt% chypoeutectoid steel at $720^{o}C$? (8M+8M)

4. a) Distinguish between white heart and black-heart malleable Iron
   b) Write short notes on the Hadfield steel? (8M+8M)

5. a) Explain the effect of various alloying elements on the shape and position of TTT diagram
   b) Write short notes on the cryogenic treatment of alloys? (8M+8M)

6. a) What are the particular characteristics of alloys of Cu-Zn system which contain only alpha solid solution?
   b) Give the composition and use of i) Catridge Brass ii) Muntz Metal (8M+8M)

7. a) Define and explain the term ceramic material.
   b) Distinguish between matrix and dispersed phase in composite materials. (8M+8M)
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Code No: RT21031 **R13** SET - 4

**II B. Tech I Semester Regular Examinations, Dec - 2014**
**METALLURGY AND MATERIAL SCIENCE**
(Com. to ME, AME)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

## PART-A

1. a) why has ferrite very low solubility of carbon while austenite has high solubility of carbon?
   b) Differentiate between ceramic and glass with examples?
   c) What is eutectic reaction?
   d) What are the factors affecting hardenability?
   e) Give the cooling curves for pure metal and alloy, label all the points?
   f) Explain about susbstitutional solid solutions?
   g) Write properties of duralumin?
   h) Define nanomaterials? (3M+3M+3M+3M+3M+3M+2M+2M)

## PART-B

2. a) Explain any one method to determine the austenite grain size?
   b) Explain about the effect of grain boundaries on the properties of Metals/Alloys. (8M+8M)

3. Explain the properties of the following?
   a) Ferrite b) Austenite c) Martensite d) Leduburite (4x 4M)

4. a) State and describe various factors affecting the properties of cast Irons.
   b) What is CEV? Why is its significance? (8M+8M)

5. a) Explain the continuous cooling transformation of 0.8%C steel with the help of TTT diagram
   b) Differentiate between annealing and normalizing? (8M+8M)

6. a) What are the characteristics of Ti that makes it attractive for certain engineering applications?
   b) Explain why two phase Ti alloys are stronger than the single phase alpha alloys. (8M+8M)

7. a) What are abrasives? What properties are required for abrasive materials? Discuss types of abrasive materials
   b) Discuss different types of fibers and matrices used in fiber composite materials. (8M+8M)
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~