

II B. Tech I Semester Regular Examinations, Dec - 2015
METALLURGY AND MATERIAL SCIENCE
(Com. to ME, AME)

Time: 3 hours

Max. Marks: 70

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- 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**
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PART-A

1. a) What is the necessity of alloying?
- b) Explain the congruent melting intermediate phase.
- c) What is effect of silicon in the metallurgy of gray iron?
- d) What is the effect of residual stresses on the strength of a metal or an alloy?
- e) What are the two crystal structures of titanium?
- f) Briefly describe the glass fiber. (3M+4M+4M+3M+4M+4M)

PART-B

2. a) Describe the mechanism of crystallization process.
- b) What are the three basic methods for grain size estimation? (8M+8M)
3. Describe the characteristic features of binary phase diagram of Fe-Fe₃C. (16M)
4. a) How the chilled cast iron are manufactured?
- b) What are the main features of spheroidal cast iron? (8M+8M)
5. a) Explain the micro structure change in annealing process.
- b) What are the methods implemented in order to minimize the formation of scales on the surface? (8M+8M)
6. Briefly describe the important commercial copper alloys. (16M)
7. Discuss the spray forming and diffusion bonding process in manufacture of metal matrix composites. (16M)



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PART-A

1. a) What are intermediate alloy phases?
 b) Explain coring miscibility gaps.
 c) What are tool steels?
 d) Why hardenable carbon steels are widely used?
 e) What property of aluminum alloy makes it MIG welded?
 f) State various applications of composite materials. (4M+4M+4M+3M+3M+4M)

PART-B

2. a) What are the characteristic features of covalent bonding?
 b) How do the grain growth and the grain size vary in the process of recovery and recrystalization? (8M+8M)
3. a) Discuss micro structural changes during cooling process.
 b) Explain the Gibb's phase rule. (10M+6M)
4. Explain the various characteristics features of white cast iron. (16M)
5. a) How does hardenability affect the heat treatment of an alloy?
 b) How the size, mass & area affect the actual cooling rate? (8M+8M)
6. Briefly described the following :
 a) Aluminium copper alloy
 b) Corrosion resistance aluminium alloy
 c) Aluminium manufacture alloy (6M+4M+6M)
7. a) Classify various categories of composites.
 b) Describe the method of processing and applications of carbon composite. (8M+8M)



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**PART-A**

1. a) How do you determine the grain size?  
b) What is phase rule?  
c) Briefly describe Hadfield manganese steel.  
d) What is homogeneity of austenite?  
e) What are disadvantages of titanium?  
f) What are the advantages of carbon-carbon composites? (4M+4M+4M+3M+3M+4M)

**PART-B**

2. a) What are the characteristic features of metallic bonding?  
b) Explain the effect of grain boundaries on the properties of metals as alloys. (8M+8M)
3. Describe the microstructures changes and phase diagram of lead tin composition. (16M)
4. a) Explain the effects of sulphur and manganese on the properties of grey cast iron.  
b) Discuss the features of gray cast iron. (8M+8M)
5. Describe any three principal methods of case hardening. (16M)
6. Discuss about alpha, alpha-beta & beta Titanium alloys. (16M)
7. Discuss the following.
  - a) Abrasive materials
  - b) Crystalline ceramics
  - c) Nano materials (6M+4M+6M)



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**PART-A**

1. a) What is grain fineness number?  
b) What is lever rule?  
c) Classify the steels based on the % of carbon.  
d) Draw the microstructure when transforming from pearlite to bainite.  
e) Differentiate between the brass and bronze alloy.  
f) What are prepegs? Explain. (3M+4M+3M+4M+4M+4M)

**PART-B**

2. Explain the following
  - i) Hume rotherys rules
  - ii) Electron compounds (16M)
3. a) Describe the transformations occurring in eutectoid and peritectoid reactions.  
b) What is the relationship between equilibrium diagrams and properties of alloys? (10M+6M)
4. Discuss the mechanical properties and applications of alloy cast irons. (16M)
5. Describe the process of tempering & austempering. (16M)
6. a) How temper designations are denoted for various non metal alloy?  
b) How corrosion resistance of copper can be increased? (10M+6M)
7. a) Describe the autoclave, sheet moulding compound to make a laminated composite.  
b) Describe the structure and properties of ceramic mixture composites. (8M+8M)

