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Code No: RT21031

R13

SET - 1

II B. Tech I Semester Supplementary Examinations, June - 2015 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 Explain metallic bond in detail. [3] a) What is an alloy? What is the need for alloying? [3] b) c) What is an eutectic temperature? [4] What are cast Irons? Why are they named so? [4] Give reasons why there exist many types of ceramics. e) [4] What are the properties that are to be considered for good bonding between f) [4] fibres and matrix. PART -B a) Explain the cooling history of 4.3% C in Fe-Fe₃C system by drawing cooling 2 [8] curve? Calculate proportionate of different phases for 2.8%C in Fe-Fe₃C diagram at [8] 1200°C, 1173°C, and 600°C. Also draw the microstructures at room temperature? What are cast Irons? Why are they named so? Give the importance of cast irons [8] 3 in the metallurgical curriculum with suitable example Explain the microstructure, properties and applications of [8] i. White Cast Iron ii. S.G. Cast Iron. What are the requirements of an age-hardenable alloy. [4] Give a typical heat treatment schedule for duralumin and explain the relevant b) [12] microstructural changes.



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Code No: RT21031 (R13) (SET - 1)

- 5 a) Mention at least three compositions of copper alloys suitable for the following applications. [10]
 - i. Ship propeller
 - ii. Bearings
 - iii. Non-sparking tools
 - iv. Springs
 - b) Discuss briefly the precipitation hardening procedure with specific reference to [6] beryllium copper.
- 6 a) Explain the differences between an alloy and alloy system. [8]
 - b) How are the alloy systems classified based on the number of elements present [8] in it. Explain them with suitable examples.
- What is MMC? Where are they used? Classify the MMCs according to the type [16] of reinforcement and explain with suitable example

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SET - 2

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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 What is the importance of grain size in steel? [3] Justify the statement "Alloy is a material which is expected of a metal, but it [3] b) is not a pure metallic element". Name possible types of Cementite in Fe-Fe₃C diagram? [4] d) Discuss in detail the effect of alloying elements in steels. [4] Distinguish between hardness and hardenability. [4] e) Discuss briefly about whisker reinforced composites? [4] f) PART -B 2 Define and explain the structural phases. [9] i. Ferrite ii. Austenite iii. Cementite. Describe the construction of the phase diagram for 2 metals completely soluble [7] in liquid state and insoluble in solid state. What are four basic types of cast Irons? Explain them with respect to 3 [16] properties, microstructure with a diagram and applications? 4 Define the term heat treatment and explain why are the steels heat treated [8] Define and explain hardness and Hardenability. [8]



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SET - 2 R13 Code No: RT21031 5 Explain the following types of malleable cast irons. [9] i. Ferritic malleable cast iron ii. Pearlitic malleable cast iron. iii. Ferrito-Pearlitic malleable Cast Iron. Explain the different kinds of carbon steels. Explain them. Also give their [7] carbon contents. (i) How the beta titanium alloys are strengthened. 6 [8] (ii) Give at least 2 applications for alpha; alpha-beta and beta titanium alloys. Explain the role of the following elements on the structure and properties of [8] copper alloys. i. lead ii. phosporus iii. aluminium iv. Manganese. 7 Explain the importance of particle size in composite materials. [8] b) Explain the differences between matrix and dispersed phase in a composite [8] material.

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SET - 3

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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** PART -A 1 Define grain and grain boundary? [3] a) Discuss various types of intermediate phases? [3] b) c) What is the effect of carbon on Mechanical properties [4] d) What is the difference between Iron-Cementite and Iron-graphite phase [4] Give the heat treatment and applications for the following steels [4] i. Austenitic stainless steels ii. Martensitic stainless steels What are laminates? Indicate their characteristics. [4] PART -B 2 Define crystallization of metal? How is that commercial alloy invariably [8] solidify with heterogeneous nucleation? What factor favours the formation of fine grained material? How is a large [8] single crystal being produced? What is the disadvantage of too high a first stage annealing temperature for 3 [8] Malleable Cast Iron? Explain. Why are alloying elements added to steels? Give some examples of common [8] alloying elements and their effect on the properties of steel. 4 Discuss the characteristics of quenchants for effective removal of heat from a [8] work piece. Explain the effect of current on the depth of hardness during the induction [8] hardening process.

1 of 2



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Co	de No	p: RT21031 R13	SET - 3
5	a)	What are the castable types of Aluminium alloys you know? Give the composition and industrial uses of LM6 alloys.	[8]
	b)	Give examples of non-heat treatable type of aluminium alloys. What are their applications.	r [8]
6	a)	Name the important properties of Titanium.	[8]
	b)	Discuss the properties and applications of Beryllium bronzes.	[8]
7	a)	Why composite materials are considered now a days as structural materials in engineering applications?	n [6]
	b)	Discuss the influence of fiber length, orientation and composition on fibre reinforced composites.	[10]

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SET - 4

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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** PART -A 1 Write a short note on Directional solidification. [3] a) What do you mean by intermediate alloy phase? [3] b) Give the classification of stainless steels? c) [4] Discuss briefly Nitriding of steels. d) [4] e) Explain the effects of quenching media on the hardness of steels. [4] What is the role of matrix in a composite material? Discuss various types of f) [4] matrix materials. Explain chemical compounds, metallic compounds and interstecial 2 [9] a) compounds with suitable examples. Explain the effect of alloying elements on the properties of steel as b) [7] substitutional and interstecial alloying elements. Draw a neat sketch of Fe-Fe₃C diagram and label all important points, lines 3 [10] a) and phases in it. Explain the solidification of hypo eutectic cast Iron. b) [6] Explain the following: 4 a) [16] (i) Natural aging (ii) Artificial aging (iii) Delayed aging (iv) Solution treatment in Age hardening process 5 Explain about Alpha and Alpha-Beta Alloys of Titanium. [8] a) Which Aluminium casting alloy develops the highest mechanical properties?. b) Why?

1 of 2



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Co	de No	: RT21031 R13	SET - 4
6	a)	Explain about Alpha and Alpha-Beta Alloys of Titanium .	[8]
	b)	Which Aluminium casting alloy develops the highest mechanical properties?.Why?	[8]
7	a)	Define the term composites. What factors influence the final properties of composites? Explain.	[8]
	b)	Explain about Glass Fibre-Reinforced Polymer composites.	[8]

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