Code No: 133BG **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, March - 2022
METALLURGY AND MATERIALS SCIENCE
(Common to ME, MCT)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) Find the Miller indices of a plane that makes an intercept of '1' on the X-axis, '2' on the Y-axis and is parallel to the Z-axis.
b) Explain the effect of grain size on mechanical properties of materials. [7+8]

2.a) Determine the Miller indices of a plane that make an intercept of 2 A^0 and 4 A^0 on the coordinate axes of an orthorhombic crystal with a:b:c = 4:3:2.
b) Classify solid solutions? Explain with necessary sketches. [7+8]

3.a) What are different methods of construction of phase diagrams? Explain the construction of isomorphous phase diagram by using cooling curves.
b) What is eutectoid transformation? Draw a neat sketch of Eutectoid phase diagram. Explain its features. [8+7]

4.a) The phase diagram of a binary system of A and B has a three phase equilibrium at 250^0 C, with the composition of α, liquid and β phases equal to 10%, 55% and 95% B. Just below 250^0 C, find the compositions at which the proeutectic phase is 1 ½ times the euectic mixture.
b) Derive Lever rule and explain its importance. [8+7]

5.a) What is hardening? Why hardening is done? What are different quenchents used in hardening? Explain the effect of cooling rate on hardening of steels.
b) Differentiate between Annealing and Normalizing. [10+5]

6.a) What is allotropy? What are different allotropic forms of iron? Show the allotropic temperatures on Fe-Fe_3C system?
b) How are tool steels different from plain carbon steels? Explain. [8+7]

7.a) Differentiate between steels and cast irons.
b) What are the important properties of aluminium? Give the important applications of aluminium and its alloys. [6+9]

8.a) Drive an equation to determine the modulus of a fibre reinforced composite when the fibres are aligned in transverse direction.
b) Give the properties and applications of polymers. [8+7]

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Code No: 133BG **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, September - 2021
METALLURGY AND MATERIALS SCIENCE
(Common to ME, MCT, MSNT)

Time: 3 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) Discuss the effect of grain size on the properties of a metal.
b) Discuss the governing rules for the formation of solid solutions. [7+8]

2.a) How the Miller indices are defined? Explain its importance in crystal structure notation.
b) Discuss any two methods for the determination of grain size. [8+7]

3.a) Differentiate between eutectic and eutectoid phase transformation reactions with examples.
b) What is polymorphism? Give atleast three examples. [8+7]

4.a) Compare and contrast between annealing and normalizing with regard to procedure, microstructure, mechanical properties and applications.
b) Define the terms – Cementite, Martensite, Ferrite and Pearlite. [8+7]

5.a) What is Jominey end quench test? Discuss in detail how hardenablity of steel is measured.
b) Discuss the characteristics of hardening and tempering methods. [8+7]

6.a) Compare and contrast between malleable cast iron and white cast iron.
b) Draw Al – Cu phase diagram and discuss its specific importance. [7+8]

7.a) Discuss the applications of titanium and its alloys.
b) What is malleablising? How microstructural changes occurs on malleablising in Cast Irons? [7+8]

8. Discuss the classification, properties and applications of composites. [15]

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Code No: 133BG **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2017
METALLURGY AND MATERIALS SCIENCE
(Common to ME, MCT, MSNT)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Find the packing efficiency in HCP lattice. [2]
b) Lattice parameter of a FCC crystal is $3.61A^0$ calculate atomic density in (111), (110) and (100) planes. [3]
c) What is the necessity of Alloying? [2]
d) Distinguish between Intermetallic Compound and Electron compound. [3]
e) What is congruent melting phase? [2]
f) Define allotropy and give examples. [3]
g) What is ASTM-grain size number? What is its importance? [2]
h) Distinguish between ordered and disordered solid solution. [3]
i) What is coring and how it can be minimized? [2]
j) What are the general requirements of a reinforcing phase? [3]

PART- B

(50 Marks)

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? [5+5]

OR

3.a) What is crystal system and explain the Brevais lattices?
b) Write explanatory notes ASTM grain size measuring methods. [5+5]

4. Write a note on Transformations of solid state. [10]

OR

5. Draw and explain the phase diagram where two components are completely soluble in both liquid and solid state with suitable examples. [10]

6.a) What is the effect of alloying elements on Fe-Fe_3C diagram?
b) Draw the TTT diagrams and explain the different cooling rates. [5+5]

OR

7.a) What is hardenability and how it is measured?
b) Differentiate between Hardening and Tempering. [5+5]

8.a) What is cast Iron and explain the classification of cast irons?
b) Differentiate between Cu alloys and Al alloys with respect to properties, heat treatment, composition and microstructure. [5+5]

OR

9.a) Draw and Explain the Cu-Zn phase diagram.
b) Write short notes on Ti alloys. [5+5]

10. Enumerate the characteristics, properties and applications of Polymers. [10]

OR

11. Write Short notes on:
    a) Metal ceramic mixtures.
    b) C- Composites. [5+5]

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Code No: 133BG

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, October - 2020
METALLURGY AND MATERIALS SCIENCE
(Common to ME, MCT, MSNT)

Time: 2 hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) Describe lattice parameters for seven crystal systems with examples for each.
b) Copper has an atomic radius of 0.128 nm, and an atomic weight of 63.5 g/mol. Compute its theoretical density. [7+8]

2. Discuss different methods of determining the grain size. [15]

3. Discuss various methods of constructing the binary phase diagrams and explain the advantages and disadvantages of each method. [15]

4. Draw TTT diagram for 0.4%C steel and explain the phase transformations that occur on cooling from austenite to room temperature under different cooling rates. [15]

5. Distinguish between the following:
a) Annealing and normalizing
b) Austenite, Pearlite and Martensite. [15]

6. Distinguish between α, β aand $\alpha+\beta$ titanium alloys with respect to composition, microstructure, properties and applications. [15]

7. Differentiate between the following:
a) Soda lime glass and fused silica
b) Vycor and Pyrex glasses. [15]

8. What are clay – based ceramics? How are they made? Explain their limitations. [15]

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Code No: 133BG **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, May/June - 2019
METALLURGY AND MATERIALS SCIENCE
(Common to ME, MCT, MSNT)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Differentiate between metal and alloy. [2]
b) Lattice parameter of a FCC crystal is $3.61A^0$. Calculate atomic density in (111), (110) and (100) planes. [3]
c) Define Gibb's phase Rule. [2]
d) List the different methods to construct the phase diagrams. [3]
e) Define hardenability and what factors it effects. [2]
f) Which alloy of Fe-Fe_3C system has the lowest melting point? [3]
g) What is carbon equivalent? [2]
h) Distinguish between macrostructure and micro structure. [3]
i) Distinguish between glasses and cermets. [2]
j) Write the applications of polymers. [3]

PART- B

(50 Marks)

2.a) State Hume-Rothery's rules for the formation of substitutional solid solution.
b) Define solid solution and explain about substitutional solid solutions with suitable examples. [5+5]

OR

3.a) Calculate the packing factor for HCP.
b) Explain about density calculations of crystal structures. [5+5]

4. Draw neatly and explain the phase diagram where two components are completely soluble in liquid state and partly insoluble in solid state (with example). [10]

OR

5.a) What is Lever rule? Apply it to phase equilibrium in an alloy of 15% B and 85% A when a liquid of 45% B is in equilibrium with a solid solution of 95% A.
b) What is Isomorphous alloy system? Explain with suitable example. [5+5]

6. Construct the TTT diagrams for 0.8wt% carbon steels. [10]

OR

7.a) What is heat treatment and explain its effect?
b) Distinguish between annealing and normalizing. [5+5]

8. Write the composition, properties and applications of the following:
   a) Duralumin
   b) Cartridge brass. [5+5]

OR

9.a) Differentiate between white Iron and grey cast Iron.
   b) Explain why extensive coring occurs in bronzes compared to brasses. [5+5]

10. Enumerate the characteristics, properties and applications of crystalline ceramics. [10]

OR

11. Write short notes on:
   a) cermets.
   b) polymers. [5+5]

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Code No: 133BG **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2018
METALLURGY AND MATERIALS SCIENCE
(Common to ME, MCT, MSNT)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1. a) Explain why grain boundaries look darker under the microscope, while the grains look brighter. [2]
   b) Draw the plane (100). [3]
   c) What is lever rule? [2]
   d) Differentiate between tool steel and Die steel. [3]
   e) Differentiate between annealing and normalizing. [2]
   f) Distinguish between peritectoid and eutectoid reactions. [3]
   g) Write the composition of cartridge brass. [2]
   h) Copper and Al are highly ductile compare to Iron. Why? [3]
   i) Differentiate between crystallize ceramics and cermet's. [2]
   j) Define ceramic and composite. [3]

PART- B

(50 Marks)

2.a) Write about crystallization of meals.
   b) What is the role of grain size on the properties of materials? [5+5]

OR

3.a) State Hume-Rothery's rules for the formation of substitutional solid solution.
   b) How do you determine the Miller Indices? Explain it with suitable example. [5+5]

4.a) What is phase rule? Give suitable examples.
   b) Draw and explain Isomorphous system. [5+5]

OR

5. Write short notes on Transformations in the solid state. [10]

6. Draw the Fe-Fe_3C Diagram and label all the points, lines, temperatures and reactions. [10]

OR

7. Draw neatly the TTT curves for Eutectoid steels. [10]

8.a) What is cast Iron and Classify it and write the properties.
   b) Write notes on Al-Cu alloys. [5+5]

OR

9.a) Write about structure, properties, heat treatment cycles and Applications of Titanium and its alloys.
   b) Explain why extensive coring occurs in bronzes compared to brasses. [5+5]

10. Enumerate the characteristics, properties and applications of cermet's and Glasses. [10]

OR

11. Write short notes on:
a) Metal Matrix composites.
b) Fiber reinforced materials. [5+5]

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