

R18

Code No: 153BC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, September/October - 2023

MATERIAL SCIENCE AND METALLURGY

(Common to ME, MCT)

Time: 3 Hours

Max. Marks: 75

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART - A

(25 Marks)

- 1.a) Define crystal. [2]
- b) What do you mean by imperfections in the solids? [3]
- c) What is solid solution? [2]
- d) What is monotectic reaction? Explain with an example. [3]
- e) What is an isothermal diagram? [2]
- f) Why heat treatment is necessary for steels? [3]
- g) What are CCC curves? [2]
- h) What is plasma hardening? [3]
- i) What is bronze? [2]
- j) What is cast iron? How they are classified? [3]

PART - B

(50 Marks)

2. What are different types of imperfections in the solids? Explain each variety in detail. [10]

OR

- 3.a) What are different types of metallic structures? Explain each one of them.
- b) Explain the properties and applications of ceramics. [6+4]
- 4.a) What is the necessity for alloying the metals? Explain the advantages.
- b) Explain the cooling behavior of pure metal.
- c) Distinguish between the following:
 - (i) Compound and Solid solution
 - (ii) Valency compound and Electron compound. [3+3+4]

OR

- 5.a) Distinguish between extended and limited solid solubility.
- b) Distinguish between intermetallic compounds and interstitial compounds.
- c) Define the following: Austenite, Pearlite, Ledeburite and cementite. [3+3+4]
6. Draw the cooling curves on a hypothetical I-T diagram for eutectoid steel and explain the phase transformations at different cooling rates. [10]

OR

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- 7.a) Differentiate between annealing and normalizing.
- b) What is hardening? Explain the method of hardening. [4+6]

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- 8.a) Draw the CCT curves for hypo eutectoid steel and explain the phase transformations while cooling at different cooling rates? How interpretation of phase transformation is done? [6+4]
- b) Write short notes on vacuum hardening. [6+4]

OR

- 9. Explain the different methods of surface hardening treatments. [10]

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- 10.a) Draw the microstructure and indicate the phases of spheroidal cast iron and explain its composition properties and applications. [6+4]
- b) Write short notes on tools steels. [6+4]

OR

- 11.a) Write the structure and properties of Titanium and Titanium alloys. [5+5]
- b) Explain the composition, properties and applications of any two copper alloys. [5+5]

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