

R22

Code No: 183BM

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, February - 2024

METALLURGY AND MATERIAL SCIENCE

(Mechanical Engineering)

Time: 3 Hours

Max. Marks: 60

Note: This question paper contains two parts A and B.

i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of **ten questions** (numbered from 2 to 11) **carrying 10 marks each**. From each unit, there are two questions and the student should answer one of them. Hence, the student should answer five questions from Part-B.

PART- A

(10 Marks)

- | | | |
|------|--|-----|
| 1.a) | Define dislocation. | [1] |
| b) | What is critical resolved shear stress | [1] |
| c) | What is the crystal structure of cementite? | [1] |
| d) | What is monotectic reaction? | [1] |
| e) | What is isothermal transformation? | [1] |
| f) | What is austenite? | [1] |
| g) | What are the product of austempering? | [1] |
| h) | What is cyaniding? | [1] |
| i) | What are cermets? | [1] |
| j) | Why white cast iron is so hard compared to other cast irons? | [1] |

PART - B

(50 Marks)

2. Describe the various imperfections in crystals and their effect on properties. [10]
- OR**
3. Explain different types of strengthening mechanisms. [10]
- 4.a) What is an equilibrium diagram? Explain the relationship between equilibrium diagrams and properties of the alloys.
- b) Explain the following: i) Lever rule ii) Coring iii) Miscibility gaps. [4+6]
- OR**
- 5.a) Distinguish between the following:
- i) Solid solutions and compounds
- ii) Electron compounds and intermediate alloy phases.
- b) Explain the governing rules for the formation of substitutional solid solutions.
- c) Explain the advantages and disadvantages of alloying. [4+3+3]
- 6.a) Differentiate between annealing and normalizing.
- b) Explain how bainite is formed from austenite. [4+6]

OR

QA QA QA QA QA QA QA G

- 7.a) Differentiate between hardening and hardenability.
b) Explain about Jominey-end quench test. [3+7]

QA QA QA QA QA QA QA G

- 8.a) Why spheroidal cast irons are more ductile than the other cast irons?
b) Explain malleablization treatment. [5+5]

OR

- 9.a) Explain continuous cooling of hypo eutectoid steel from austenite at different cooling rates.
b) Explain the applications of induction hardening. [5+5]

QA QA QA QA QA QA QA G

- 10.a) What are composite materials? Compare and contrast between two phase alloys and composite materials.
b) Explain the classification of composite materials based on matrix materials. [6+4]

OR

11. Write short notes on the following:
a) Tool steels
b) Maraging steels. [5+5]

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QA QA QA QA QA QA QA G

QA QA QA QA QA QA QA G

QA QA QA QA QA QA QA G

QA QA QA QA QA QA QA G