



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

SUMMER-2024	
Exam Seat No.:	
Academic Year:2023-2024	Semester: III
Class: SY B. Tech Mechanical	Program: B.Tech
Branch Code: MEC	Pattern:2022
Name of Course: Engineering Metallurgy	Course Code: MEC222003
Max. Marks:60	Duration:2.30 Hrs.

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains two page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

**Question No. 1 Attempt following Question**

- 1a) Why is metal extraction necessary? State the purpose of steps that are involved in the process. (6) CO1

**Question No. 2 Attempt following Question**

- 2a) State the rule that governs the formation of substitutional solid solution. (6) CO2

**Question No. 3 Attempt following Question**

- 3a) How do the Time-Temperature-Transformation (TTT) diagram and Continuous Cooling Transformation (CCT) diagram differ, and how would their application impact material processing and properties? (8) CO3

**OR**

- 3b) How do annealing and normalizing differ in their effects on grain size, heating temperatures, strength, and internal stresses? (8) CO3

- 3c) Represent full annealing, normalizing and hardening on CCT diagram. (8) CO3

**OR**

- 3d) Explain Flame Hardening with the help of neat diagram. Comment how it is different from other heat treatments? (8) CO3

**Question No. 4 Attempt following Question**

- 4a) With respect to the relation with carbon, classify alloying elements. Mention the names/name of alloying elements from each class. (8) CO4

4b) Write short note on effect of following alloying elements on the properties of steel: (8) CO4  
i) Sulphur ii) Silicon iii) Phosphorus iv) Manganese

4c) Explain the significance of Anodic Protection. (8) CO4

**OR**

4d) What are Alloying elements? Explain effect of any two elements with suitable example. (8) CO4

**Question No. 5 Attempt following Question**

5a) List the tools employed in forging industries and describe their functions. (8) CO5

**OR**

5b) List the essential equipment used in wire drawing industry and state their functions. (8) CO5

5c) What are the general PPE provisions? (8) CO5

**OR**

5d) State the administrative controls/work practice control in PPE. (8) CO5

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