7/10/26 FN

Name..... Roll No.....

Mar Athanasius College of Engineering, Kothamangalam
Government Aided Autonomous Institution

Second Sessional Examination, October 2026

B24ME2T03 METALLURGY AND MATERIALS SCIENCE
S3 MECHANICAL (A & B)

Time: 1 Hour 30 Minutes **Marks:40**

Part A (4*3=12 Marks)

1. Why is alloying necessary? Mention any three purposes of alloying. **(CO 3)**
2. State the Hume-Rothery rules for formation of substitutional solid solutions. **(CO 3)**
3. What are the different types of invariant reaction in phase diagram? **(CO 4)**
4. What is the Gibbs phase rule? Write its mathematical expression. **(CO 4)**

Part B (14*2=28 Marks)

5. (a) Explain the mechanisms of diffusion in solids. Discuss any three important engineering applications of diffusion with suitable examples.
   (b) Explain the Jominy end-quench test? What property does it determine? **(7 +7 Marks, CO3)**

6. (a) Draw and explain the Iron–Carbon equilibrium diagram. Identify the important invariant reactions and state the phases involved in each reaction.
   (b) Differentiate between annealing and normalizing. Explain Hardening and significance of quenching in hardening Process. **(7 +7 Marks, CO4)**

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Mentoring to Ensure Excellence

Mission
- To Facilitate comprehensive and integrated devlopement of students by providing quality education that encourages sustainable practices
- To mould disciplined and socailly committed engineers capable of assuming professional leadership upholding national integrity.