MAR ATHANASIUS COLLEGE OF ENGINEERING, KOTHAMANGALAM – 686 666.
(GOVERNMENT AIDED AUTONOMOUS ENGINEERING COLLEGE)

DEPARTMENT OF MECHANICAL ENGINEERING

SECOND SESSIONAL EXAMINATION, OCTOBER 2025
S3 ME A BATCH

B24ME2T03 - METALLURGY & MATERIAL SCIENCE

Time –1hr 30mins **Max: 40 Marks**

PART-A
Answer All Questions.

1.	**(a)** Briefly describe the phenomenon of coring and why it occurs. **(b)** Cite one undesirable consequence of coring.	**CO 3**	**3 Marks**
2.	Briefly explain why, upon solidification, an alloy of eutectic composition forms a microstructure consisting of alternating layers of the two solid phases.	**CO 3**	**3 Marks**
3.	What is the difference between cast iron and steel?	**CO 4**	**3 Marks**
4.	Explain the effect of alloying elements in different phases of Iron–Carbon Alloys system.	**CO 4**	**3 Marks**

PART - B
Answer All Questions.

5.	Explain Iron–Iron Carbide Phase Diagram and Development of Microstructure in Iron–Carbon Alloys. Compute the mass fractions of ferrite and cementite in pearlite.	**CO3**	**14 Marks**
6.	Explain different strengthening mechanism of steel.	**CO 4**	**14 Marks**

Vision

Mentoring to Ensure Excellence

Mission

To facilitate comprehensive and integrated development of students by providing quality education that encourages sustainable practices.
To mould disciplined and socially committed engineers capable of assuming professional leadership upholding national integrity.

Mar Athanasius College of Engineering, Kothamangalam
Second Series Exam – October 2025
Third Semester Mechanical Engineering (S3MB)

B24ME2T03 - METALLURGY AND MATERIAL SCIENCE

Time: 1 hr 30 mints **Marks: 40**

PART-A (Answer all questions, 3 marks each)

1. Define Gibbs phase rule.
2. What is Frank-Read source?
3. What are the stages involved in normalizing heat treatment process?
4. Explain spheroidizing heat treatment process with figure.

(4 X 3 = 12 marks)

PART-B (Answer all questions)

5. **(a)** Discuss vacancy diffusion and interstitial diffusion. (7 marks)

   (b) State and Derive expression for Fick's laws of diffusion. (7 marks)

6. Draw the labelled iron-iron carbide phase diagram showing all phase boundaries and invariant reactions. Write the reactions at the invariant points and mention the phases present. (14 marks)

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