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

Mar Athanasius College of Engineering, Kothamangalam
Government Aided Autonomous Institution

First Sessional Examination, August 2026

B24ME2T03 METALLURGY AND MATERIALS SCIENCE
S3 MECHANICAL (A Batch)

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

Part A (4*3=12 Marks)

1. What is the difference between the microstructure and the macrostructure of a material? (CO1)
2. Make a plot of bonding energy versus melting temperature for the metals. Interpret the plot. (CO1)
3. Explain how temperature affects the concentration of point defects in crystals. (CO2)
4. Discuss the application of substitutional defects in alloy design with relevant examples. (CO 2)

Part B (14*2=28 Marks)

5. (a) With neat sketch explain all different point defects in material.
   (b) Differentiate between edge and screw dislocation. (7 +7 Marks, CO2)
6. (a) A single crystal has a slip plane (110) and a slip direction [111]. It is subjected to a tensile stress of 80 MPa. The angle between the tensile axis and the normal to the slip plane is 45°, and the angle between the tensile axis and the slip direction is 45°.
   Using Schmid's Law, determine the resolved shear stress acting on the slip system. Justify your answer by stating the law, explaining its significance, and illustrating the geometry with a neat labeled sketch.
   (b) Zinc has an HCP crystal structure, a ratio of 1.856, and a density of 7.13 g/cm3. Compute the atomic radius for Zn. (7 +7 Marks, CO1)

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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.