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

DEPARTMENT OF MECHANICAL ENGINEERING

FIRST SESSIONAL EXAMINATION, AUGUST 2025
S3 ME A BATCH

B24ME2T03 - METALLURGY & MATERIAL SCIENCE

Time –1hr 30mins **Max: 40 Marks**

PART-A
Answer All Questions.

1.	With a neat sketch, explain the variation of potential energy between two atoms as a function of interatomic separation and discuss how bonding energy influences the coefficient of thermal expansion.	**CO 1**	**3 Marks**
2.	Using the concept of bonding, explain why copper is widely used in electrical wiring and aluminium in overhead power cables.	**CO 1**	**3 Marks**
3.	For the HCP crystal structure, show that the c/a is 1.633.	**CO 1**	**3 Marks**
4.	Name the stages involved in the formation of particles of a new phase. Briefly describe each and the significance of the critical radius.	**CO 1**	**3 Marks**

PART - B
Answer All Questions.

5.	With a neat, labelled diagram, describe the Body-Centred Cubic (BCC) crystal structure. Derive the relation between the lattice parameter and atomic radius for the BCC structure. Calculate the coordination number, atomic packing factor (APF), and number of atoms per unit cell for BCC. Identify the close-packed directions and close-packed planes in BCC using Miller indices	**CO 1**	**14 Marks**
6.	Discuss the types of point defects in crystalline solids, explain their effect on material properties such as electrical conductivity and mechanical strength.	**CO 2**	**14 Marks**