Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. / B. Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, Nov / Dec 2024

B.E. Materials Science and Engineering

MS23301 & STRUCTURE AND PROPERTIES OF MATERIALS

(Regulation 2023)

Time: 3hrs Max.Marks: 100

CO 1	Relate the connection between structure and properties of materials and explain different types of chemical bonds and their influence on properties
CO 2	Discuss on the similarities and differences in the symmetries of different crystal systems and Bravais lattices and index different planes and directions in crystals
CO 3	Explain the various defects in metals, ceramics, and polymers
CO 4	Elaborate on the different types of Solid solutions and gives an overview of Strengthening mechanisms
CO 5	Summarize the fundamental differences between metals, polymers and ceramics.

BL – Bloom's Taxonomy Levels

(L1 - Remembering, L2 - Understanding, L3 - Applying, L4 - Analyzing, L5 - Evaluating, L6 - Creating)

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

Q. No	Questions	Marks	CO	BL
1	What are the design criteria on which engineering components manufactured?	2	1	L3
2	What are the typical properties of metals that arise from the nature of their bonding?	2	1	L3
3	Distinguish between crystalline and non-crystalline solids?	2	2	L2
4	Differentiate between space lattice and crystal structure?	2	2	L2
5	What is the difference between in the stacking sequence of close packed layers in FCC and HCP structures?	2	3	L3
6	What are the importance of defects in solids?	2	3	L2
7	What is quasicrystals and given an example?	2	4	L1
8	Distinguish between macrostructure and microstructure?	2	4	L2
9	Define tacticity?	2	5	L1
10	What are the functional properties of ceramics?	2	5	L1

PART- B (5 x 13 = 65 Marks)

Q. No	Questions	Marks	CO	BL
11 (a)	Differentiate between metals, ceramics, polymers and composites with respect to the basic structure, properties and applications?	13	1	L3
	OR			
11 (b)	Schematically plot attractive, repulsive, and net energies versus interatomic separation for two atoms.	13	1	L4
12 (a)	Distinguish between unit cell and primitive cell? Name some systems in which both are identical? Describe the rotational symmetry operations?.	13	2	L3
	OR			
12 (b)	Describe the concept and applications of stereographic projections?	13	2	L2
13 (a)	What are voids in metals? Distinguish between two interstitial voids in metals? Show them clearly by diagram?	13	3	L2
	OR			
13 (b)	What is point defect? Explain the point defects with respect to thermodynamic equilibrium?	13	3	L2
14 (a)	i) Distinguish between commercially pure metal and an alloy, ii) An alloy is more useful than a pure metal. Discuss, iii) What is master alloy? What are its chief characteristics and iv) What is the difference between random and ordered solid solution?	13	4	L4
	OR			
14 (b)	What is strain hardening? Explain them in detail?	13	4	L2
15 (a)	Write a note on i) Thermoplastics polymers and ii) Thermoset polymers.	13	5	L1
	OR			
15 (b)	Discuss the following: i) Ceramics, ii) Non-stoichiometric defect in ceramics, iii) Silicate structures of ceramics and iv) radius ratio.	13	5	L2

PART- C (1 x 15 = 15 Marks)

(Q.No.16 is compulsory)

Q. No	Questions	Marks	CO	BL
16.	What is age-hardening? What are the main requirements? What is the driving force for the age-hardening? Discuss the steps? Differentiate between coherent and semi-coherent precipitates?	15	4	L4