

**VIT**

Vellore Institute of Technology

SCHOOL OF MECHANICAL ENGINEERING
CONTINUOUS ASSESSMENT TEST - I**SLOT: B1+TB1****FALL SEMESTER 2022-2023****Programme Name & Branch****Course Code/Name****Faculty Name(s)****Class Number(s)****Duration: 90 min.**

: B.Tech. Mechanical Engineering

: BMEE209L / Materials Science and Engineering

: Dr. K. Devendranath Ramkumar

: VL2022230100533

General instruction(s):**Max. Marks: 50**

Q. No	Question	Marks	Course Outcome (CO)	Bloom's Taxonomy (BL)
1.	(a) Calculate the theoretical volume change accompanying a polymorphic transformation in a pure iron from FCC to BCC crystal structure. Assume the hard sphere atomic model and that there is no change in atomic volume before and after transformation.	07	CO1	BL2
	(b) Determine the inter-planar spacing of copper in the closely packed plane (d_{hkl}) with a lattice constant of 0.361 nm?	03		
2.	(a) Derive planar density expressions for FCC (100) and (111) planes in terms of the atomic radius. <i>2 111 → less than</i>	07	CO1	BL2
	(b) Compute and compare planar density values for these same two planes for nickel, whose lattice constant is 0.125 nm. <i>22.62 36</i>	03		
3.	Find the direction common to (110) and (110) planes by (a) geometric methods and (b) the application of Weiss Zone Law.	10	CO1	BL2
4.	(a) Mention in detail any five traits that can be inferred from the microstructure examination	04	CO1	BL3
	(b) Determine the ASTM grain size number if 12 grains per square inch are measured at a magnification of x 500.	03		
	(c) Compare and contrast the thermosetting and thermoplastic polymers based on processing and applications.	03		
5.	(a) The yield strength of mild steel with an average of 0.08 mm is 200 MPa. The yield strength of the same metal is 360 MPa if the grain size is 0.005 mm. What will be the average grain size of the same steel with a yield strength of 240 MPa? Assume the Hall-Petch equation is valid and that changes in the observed yield stress are due to the changes in grain size.	07	CO1	BL2
	(c) What is the metallurgical problem associated with the wreckage of titanic ship?	03		

$$\frac{1}{\sqrt{2}} \times 3 = \frac{1}{\sqrt{2}} \times 3$$

$$\frac{1}{\sqrt{2}} \times 3 = \frac{1}{\sqrt{2}} \times 3$$

$$\frac{3}{4} \times \frac{2}{2}$$