



SCHOOL OF MECHANICAL ENGINEERING
CONTINUOUS ASSESSMENT TEST - I

FALL SEMESTER 2022-2023

SLOT: B1+TB1

Programme Name & Branch : B. TECH (MECHANICAL ENGINEERING)

Course Code/Name: BMEE209L

Faculty Name(s):: Prof(s). SITARAM DASH, M. S. SREEKANTH, MD. FASEEULLAKHAN, YAZAR K. U.

Class Number(s): VL2022230100537/561/540/543

Duration: 90 min.

Max. Marks: 50

General instruction(s):

Answer all questions. Please read questions carefully before answering

Q. No	Question	Marks	Course Outcome (CO)	Bloom's Taxonomy (BL)
1	a) With the help of material tetrahedron explain how structure-property correlation will help material processing requirement? Elucidate your answer with suitable example. (5 marks) b) Differentiate between metals and ceramics with respect to density, ductility and electrical conductivity. Justify your answer with suitable explanation and examples. (5 marks)	10	1	2
2	a) Why are Piezoelectric materials known as smart materials? Why is BaTiO ₃ piezoelectric? (4 marks) b) An FCC unit cell with lattice parameter a transforms to a BCC unit cell with similar lattice parameter. Work out volumetric changes that accompany such a transformation (6 marks)	10	1	2
3	a) Distinguish crystalline and amorphous solids. Explain atomic arrangement in quartz and glass with suitable schematic. (5 marks) b) Draw following crystallographic planes in cubic crystals. (5 marks) (101) , (112) , $(1\bar{1}1)$ and (011)	10	1	3
4	a) Draw the crystal structure of Titanium metal. Indicate various types of planes and compute volume of unit cell in terms of lattice parameters a and c . (5 marks) b) Draw a bcc unit cell and compute linear density along $[111]$ direction. (5 marks)	10	1	1
5	a) Compute number of vacancies per cubic meter of Aluminium at 300 degree C. The energy for vacancy formation is 0.56 eV/atom. The atomic weight and density of aluminium are 27 gm/mole and 2.7 gm/cm ³ , respectively. (6 marks) b) Conceptually explain difference between deformation by slipping and twinning with the help of suitable schematic. (4 marks)	10	1	1