Academic year 2023-2024 (Odd Sem)

DEPARTMENT OF
MECHANICAL ENGINEERING
CIE I

Date	**8th January 2024**	Maximum Marks	**50**
Course Code	**ME232AT**	Duration	**90 Minutes**
Course Name	**MATERIALS SCIENCE FOR ENGINEERS**		Sem: 3

Q. No.	Questions	M	BT	CO
1.	Describe all the primary and secondary bonds with examples.	10	2	1
2.	Explain energy bands for metals, Semiconductors, and insulators with a neat sketch.	10	3	1
3.	Calculate Atomic packing factor for FCC unit cell. Define the following with respect to solid materials: i) space lattice, ii) unit cell iii) Atomic Packing Factor. 6m	04 06	4 1	1 1
4.	Explain properties and applications of ceramics and composites with examples.	10	2	1
5.	Explain the following defects: vacancy, edge dislocations, grain boundary.	10	2	1

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	TEST	Marks	50	-	-	-	06	30	10	4		

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Academic year 2023-2024 (Odd Sem)

DEPARTMENT OF
MECHANICAL ENGINEERING
CIE II

Date	**20th February 2024**	Maximum Marks	**50**
Course Code	**ME232AT**	Duration	**90 Minutes**
Course Name	**MATERIALS SCIENCE FOR ENGINEERS**		Sem: 3

Q. No.	Questions	M	BT	CO
1a.	With the help of a stress-strain diagram explain toughness and ductility of a material	04	3	2
1b.	Using stress-strain diagram distinguish ductile and brittle fracture	06	2	2
2.	Explain the following properties: thermal expansion coefficient, thermocouple. luminescence, optical fibres	10	3	2
3.	Describe the following: ferroelectricity, piezoelectricity, superconductor,	10	4	2
4.	Explain the properties and applications of following materials with examples. Ceramics and Fiber reinforced composites	10	3	2
5.	Explain the properties and applications of following materials. stainless steel, cast iron and titanium alloys.	10	3	2

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars		CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	TEST	Marks	-	50	-	-	06	30	10	4		

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NBA Accredited (UG - 6Years)

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Department of Mechanical Engineering

CIE – Improvement

Date	March 2024	Maximum Marks	50
Course Code	ME232AT	Duration	90 Min
Course Name	Materials Science for Engineers	**USN:**	Sem: 3

Q. No.	Questions	M	BT	CO
1a.	Define heat treatment and explain the purpose of heat treatment.	5	2	3
1b.	Discuss the advantages and applications of rapid thermal processing for electronic devices.	5	2	3
2a.	Differentiate between annealing and normalising heat treatment processes.	5	3	3
2b.	Describe the full annealing heat treatment process for ferrous materials.	5	3	3
3a.	Explain the steps involved in thermal oxidation of semiconductor devices.	6	3	3
3b.	Describe the defects of heat treatment process for different materials.	4	2	3
4.	With the help of TTT diagram explain hardening process.	10	3	3
5.	Explain the following heat treatment processes with neat sketches: i) Flame hardening and ii) carburising	10	3	3

BT-Blooms Taxonomy, CO-Course Outcomes, M-Marks

Marks Distribution	Particulars	CO1	CO2	CO3	CO4	L1	L2	L3	L4	L5	L6
	TEST Marks	-	-	50	-	-	14	36			

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ME232TB

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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution Affiliated to VTU)

III Semester B. E. Examinations April/May-2024

Common to All Branches

MATERIAL SCIENCE FOR ENGINEERS

Time: 03 Hours ***Maximum Marks: 100***

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2 is compulsory. Answer any one full question from 3 and 4, 5 and 6, 7 and 8, 9 and 10.

PART-A

			M	BT	CO
1	1.1	Ceramic materials are generally having _____ type of bonds.	01	1	1
	1.2	When the electrical behaviour of the material are dominated by the electronic structure of pure metal, the material can be called as _____ semi-conductors.	01	1	1
	1.3	Give an example of natural composite.	01	1	1
	1.4	T_i is having _____ crystal structure at room temperature.	01	1	1
	1.5	For the application of extremely high temperatures, _____ type of basic materials are used.	01	1	1
	1.6	$Cu - Ni$ alloys are an example of _____ type of defect.	01	1	1
	1.7	Deformations by twins are commonly observed in _____ type of metals.	01	1	1
	1.8	Calculate the co-ordination number of BCC crystal systems.	01	1	1
	1.9	External surfaces are an example of _____ type of defects in crystal systems.	01	1	2
	1.10	Viscoelastic deformation is observed significantly in _____ basic material.	01	1	2
	1.11	Diamond pyramid indenter is used in _____ hardness testing.	01	1	2
	1.12	Addition of chromium (Cr) to steel enhances _____ property.	01	1	2
	1.13	Which property of dielectric materials is measured in materials testing?	01	1	2
	1.14	Photodiodes serves as a _____ in optical communication systems.	01	1	2
	1.15	Name the hardening process which introduces nitrogen into the surface layer of steel to produce nitrides at the surface layer of the component.	01	1	3
	1.16	_____ is a critical process in electronics manufacturing primarily used in surface-mount technology.	01	1	3
	1.17	Aggregated composites possess _____ strength compared to fiber reinforced composites.	01	1	3
	1.18	Sol-gel process is an example of _____ approach of synthesis of nanomaterials.	01	1	4
	1.19	Crystalline structures of materials are measured on the basis of lattice spacing and electron interaction with it, in _____ characterization technique.	01	1	4
	1.20	Name characterization technique for nanostructure in which atomic structures of the materials are observed using electrons passing through ultra-thin specimens.	01	1	4

PART-B

2	a	Describe the following bonds for solid materials with examples. i) Ionic bonds ii) Secondary bonds and iii) Metallic bonds.	08	2	1
	b	Explain the following crystallographic features of a Solid material. i) *FCC* crystal structure with example ii) Energy bands in insulator iii) Edge dislocation in a metal.	08	2	1
3	a	Define and explain the following thermal properties of a material. i) Thermo-electric effect ii) Linear thermal expansion coefficient iii) Thermal shock.	08	2	2
	b	Explain the principle of working of following materials. i) Piezoelectric materials and ii) Thermocouples.	08	3	2
		OR			
4	a	With a stress-strain curve, explain the following properties of a material. i) Young's Modulus ii) Ultimate Tensile Strength and iii) Toughness.	08	3	2
	b	Define the following mechanical properties of a solid material. i) Fracture toughness ii) Hardness iii) Fatigue limit.	08	2	2
5	a	Explain the properties and applications of stainless steel.	06	2	2
	b	Mention the dopant used for p-type and n-type semiconductors.	04	2	2
	c	Explain the properties and applications of ceramics.	06	2	2
		OR			
6	a	Explain the properties and applications of fiber reinforced composites.	08	2	2
	b	Classify forming processes of structural materials and explain any two forming processes.	08	2	2
7	a	Explain the steps involved in thermal oxidation method of semiconductor devices.	08	3	3
	b	Describe the cause, effect and prevention methods of any two defects of heat treatment process of metals.	08	2	3
		OR			
8	a	Differentiate between annealing and normalizing process of ferrous materials.	08	3	3
	b	Describe hardening of steel with the help of *TTT* diagram.	08	2	3
9	a	Define nanomaterials and describe the applications of nanomaterials with example.	08	2	4
	b	Describe the effect of particle size and surface area of nanomaterials on the mechanical and optical properties of it.	08	2	4
		OR			
10	a	Describe the significant properties and applications of carbon nanotubes.	08	2	4
	b	Describe the principle of working of *X*-Ray Diffraction (*XRD*) techniques for the characterization of solid materials.	08	3	4