P P SAVANI UNIVERSITY

Third Semester of B. Tech. Examination

December 2022

SEME2020 Material Science & Metallurgy

03. 12. 2022, Saturday **Time: 10:30 a.m. To 1:00 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

SECTION – I

			CO	BTL
Q - 1	MCQ/Short Question/Fill in the Blanks (Any Three)	**[03]**		
(i)	Define: Bravais Lattice		**4**	**1**
(ii)	A part produced by Powder metallurgy is termed a a. Welded part b. Cast part c. Forging part d. Sintered part		**6**	**1**
(iii)	Write down Gibbs's Phase rule.		**1**	**2**
(iv)	List out various defects in metals.		**3**	**1**
Q - 2 (a)	Explain with neat sketches the arrangements of atoms in B.C.C, F.C.C and H.C.P. lattice. Define unit cell. Show that a F.C.C. structure is always more closed packed than B.C.C Structure.	**[06]**	**4**	**4**
Q - 2 (b)	Draw Miller indices for planes (0 1 1), (1 0 0), (1 1 1) and (1 $\bar{1}$ 0)	**[06]**	**4**	**4**
	OR			
Q - 2 (a)	Do the detailed classification of engineering material	**[06]**	**1**	**2**
Q - 2 (b)	Define atomic packing factor (APF). Calculate APF for Face centered cubic (FCC) structure with a neat sketch	**[06]**	**4**	**3**
Q - 3 (a)	State advantage and disadvantages of powder metallurgy.	**[05]**	**6**	**2**
Q - 3 (b)	What is heat treatment of steel? what is objective?	**[05]**	**2**	**2**
	OR			
Q - 3 (b)	Copper has an FCC structure and an atom radius of 1.278 °A. Calculate its density. Given atomic weight of copper as 63.5 g/mol and Avogadro's Number as 0.602 * 1024 atoms/mol.	**[05]**	**4**	**3**
Q - 4	Attempt anyone.	**[05]**		
(i)	Write the basic steps for powder metallurgy method.		**6**	**2**
(ii)	Write short note on: Induction Hardening.		**2**	**2**

SECTION – II

Q - 1	Answer the Following: (Attempt any five)	**[05]**		
(i)	What are the advantages of aluminum alloys?		**1**	**1**
(ii)	What is the role of the matrix in a composite material?		**1**	**1**
(iii)	What is degree of polymerization?		**1**	**1**
(iv)	What is the necessity of Alloying?		**1**	**1**
(v)	In which type of test the capillary action principle is used?		**5**	**2**
(vi)	What are the types of manufacturing methods for composites?		**1**	**1**

(vii)	What happens when thermosetting polymers are heated?		1	2
Q - 2 (a)	Name at least four important copper base alloys. Give composition microstructure and their applications.	[05]	1	1
Q - 2 (b)	What are cermets? Explain with examples	[05]	1	2
	OR			
Q - 2 (a)	Mention in brief the role of Nickel, Chromium, Molybdenum and Vanadium as alloying element in steel	[05]	1	1
Q - 2 (b)	Discuss the various steps associated in performing the liquid penetrant test.	[05]	5	2
Q - 3 (a)	What are glasses? How they manufacture?	[05]	1	2
Q - 3 (b)	Differentiate between white cast iron and malleable cast iron	[05]	1	2
	OR			
Q - 3 (a)	State the principle of magnetic particle testing and enumerate the steps for it.	[05]	5	3
Q - 3 (b)	What factors affect the crystallization of polymers?	[05]	1	2
Q - 4	Attempt any one	[05]		
(i)	Differentiate between thermoplastic polymers and thermosetting polymers. Give minimum two examples of each type.		1	2
(ii)	Write short notes on Metal Matrix composites		1	2

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CO : Course Outcome Number BTL : Blooms Taxonomy Level

Level of Bloom's Revised Taxonomy in Assessment

1: Remember	2: Understand	3: Apply
4: Analyze	5: Evaluate	6: Create