P P SAVANI UNIVERSITY

Third Semester of B. Tech. Examination

May 2019

SEME2020 Material Science and Metallurgy

23.05.2019, Thursday **Time: 09:30 a.m. To 11:00 a.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

Q - 1	**Attempt Any Five.**	**[05]**
(i)	The number of atoms in a unit cell of bcc, fcc and hcp metals are : (a) 4, 2, 6, respectively (b) 6, 4, 2, respectively (c) 2, 4, 6, respectively (d) none of the above	
(ii)	Define atomic packing factor.	
(iii)	Which one of the following is not basic component of Materials science? _____. (a) Cost (b) Properties (c) Structure (d) Performance	
(iv)	Micro-structure of a material is, generally, examined by _____ (a) naked eye (b) optical microscope (c) X-ray techniques (d) none of these	
(v)	A material is said to be allotropic, if it has _____ (a) fixed structure at all temperatures (b) atoms distributed in random pattern (c) different crystal structures at different temperatures (d) any one of the above	
(vi)	For any material Freezing Temperature and Melting temperature Both are Same. True or False?	
(vii)	Define Metallography.	
Q - 2 (a)	Differentiate between Edge and Screw dislocation	**[05]**
Q - 2 (b)	Explain TTT diagram with neat sketch.	**[05]**
	OR	
Q - 2 (a)	Explain the 'Lever rule' based on the phase diagram of binary alloy.	**[05]**
Q - 2 (b)	What is Gibb's phase rule? Calculate the degree of freedom, for eutectic composition in binary phase diagram.	**[05]**
Q - 3 (a)	Draw a neat sketch of SC, BCC, FCC and HCP structures.	**[05]**
Q - 3 (b)	Enlist various heat treatment processes and explain any one with necessary sketch.	**[05]**
	OR	
Q - 3 (a)	Derive the expression for relationship between atomic radius and lattice parameter in Face Centered Cubic (FCC) Lattice. Find the effective number of atoms/unit cell, atomic packing factor and coordination number.	**[05]**
Q - 3 (b)	Explain Austempering and Martempering.	**[05]**
Q - 4	**Attempt any one**	**[05]**
(i)	What is Powder Metallurgy? Enlist any ten applications of powder metallurgy.	
(ii)	List down the merits and limitations of powder metallurgy.	

SECTION – II

Q - 1 **Attempt Any Five.** **[05]**

(i) Iron-carbon alloys containing 1.7 to 4.3% carbon are known as_____
(a) eutectic cast irons (b) hypo-eutectic cast irons
(c) hyper-eutectic cast irons (d) none of these

(ii) The type of space lattice found in gamma-iron is_____
(a) FCC (b) BCC (c) HCP (d) none of these

(iii) Which is the hardest and softest structure in Fe – C diagram?

(iv) Bronze is a mixture of
a) Copper and Tin b) Copper and Zinc
c) Copper and Aluminium d) Copper, Zinc and Tin

(v) Define the terms : Major energy losses and minor energy losses in pipe.

(vi) Cast Iron is Produced in
a) Blast Furnace b) Cupola
c) Open Heart Furnace d) Bessemer Convertor

(vii) The compressive strength of Cast Iron is _____ that of its Tensile strength.
(a) Equal to (b) less than (c) more than

Q - 2 (a) What do you mean by Allotropy? Explain with example. **[05]**

Q - 2 (b) Differentiate a following Term: **[05]**
(1) Impact and Toughness
(2) Ductility and Malleability

OR

Q - 2 Explain Fe - FeC equilibrium diagram with neat sketch. **[10]**

Q - 3 (a) Explain following alloys giving their important constituents & Applications : **[05]**
(I) Monel (II) Invar (III) Nichrome.

Q - 3 (b) Differentiate between malleable and nodular cast iron. **[05]**

OR

Q - 3 (a) For stainless steel we cannot use MPT. Why? State reason and explain MPT method in detail. **[05]**

Q - 3 (b) Give the effects of following alloying elements in steels. **[05]**
(1) Silicon (2) Nickel (3) Chromium (4) Tungsten

Q - 4 **Attempt any one.** **[05]**

(i) Write a short note on Fibre Reinforced Composite.

(ii) Give Classification & characteristics of polymers.

****