Total No. of Questions: 6 *Total No. of Printed Pages:2*

Enrollment No.....

Faculty of Engineering
End Sem Examination Dec-2023
EN3ES25 Engineering Materials

Programme: B.Tech. Branch/Specialisation: AU/ME

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. In a simple cubic structure, if the edge length is 2 units then atomic radius is _____. **1**
(a) 1 units (b) 2 units (c) 4 units (d) Data insufficient

ii. The co-ordination number of BCC is _____ . **1**
(a) 6 (b) 8 (c) 12 (d) 14

iii. Which curve is associated with fatigue testing? **1**
(a) Phase diagram (b) Imperfection diagram
(c) S-N Curve (d) TTT diagram

iv. By decreasing the grain size, strength of the material_____. **1**
(a) Increases (b) Decreases
(c) Remains same (d) Data insufficient

v. Which microstructure has alternate layers of ferrite and cementite? **1**
(a) Austenite (b) Ledeburite (c) Pearlite (d) None of these

vi. P+F = C+2 , is also termed as _____. **1**
(a) Tie Rule (b) Hume Rothary rule
(c) Gibb's phase rule (d) Grubbler's criteria

vii. 18:4:1 is the percentage composition of which alloy? **1**
(a) Tool Steel (b) HSS (c) TRIP steel (d) Stainless steel

viii. HSLA stands for- **1**
(a) High Steel Low Aluminum
(b) High-Strength, Low-Alloy
(c) High Sulphur Low Aluminum
(d) None of these

ix. Natural Rubber is an example of _____. **1**
(a) Ceramic (b) Composite (c) Polymer (d) None of these

x. Structure of common glass is _____. **1**
(a) Crystalline (b) Granular (c) Amorphous (d) None of these

Q.2 i. What are different types of bonds in materials? **4**

ii. What do you mean by atomic packing factor? Determine the atomic packing factor of Simple cubic structure. **6**

OR iii. What do you mean by imperfections in Crystalline solids? Explain its types with neat sketch. **6**

Q.3 i. What are different mechanical properties of materials? Explain any three of them. **4**

ii. Draw labelled stress-strain diagram of the following- **6**
(a) Polymer (b) Ductile material (c) Ceramic

OR iii. What is meant by strengthening mechanism? Explain any two strengthening mechanism. Draw necessary diagram in support of your answer. **6**

Q.4 i. Define the following heat treatment processes- **2**
(a) Annealing (b) Tempering

ii. Explain Hume Rothary rule for solid solution. **3**

iii. Draw and explain Time-Temperature-Transformation curve showing various microstructures during the decomposition of Austenite. **5**

OR iv Draw Iron-Carbon diagram. Explain the important reactions with temperature and percentage composition. **5**

Q.5 i. Explain the composition and properties of any two copper-based alloys. **4**

ii. Write detailed classification of cast iron. Explain each type in terms of composition, property and application. **6**

OR iii. Write short note on the following- **6**
(a) Stainless steel (b) Nickel based alloys

Q.6 Attempt any two:

i. What do you understand from the term composite? Explain its properties and applications. **5**

ii. Write detailed classification of Polymers. Also list their properties and applications. **5**

iii. Define the term ceramic. What are its types? Explain their properties. **5**

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Scheme of Marking

Engineering Materials (T) - EN3ES25 (T)

Q.1	i)	a) 1 units		**1**
	ii)	b) 8		**1**
	iii)	c) S-N Curve		**1**
	iv)	a) Increases		**1**
	v)	c) Pearlite		**1**
	vi)	c) Gibb's phase rule		**1**
	vii)	b) HSS		**1**
	viii)	(b) High-strength, low-alloy		**1**
	ix)	c) Polymer		**1**
	x)	(c) Amorphous		**1**
Q.2	i.	Bond types and explanation		**4**
	ii.	Definition	1 mark	**6**
		Diagram	1 mark	
		Derivation	4 marks	
OR	iii.	Definition	1 mark	**6**
		Diagram and explanation	5 marks	
Q.3	i.	Name of mechanical properties	1 mark	**4**
		Explanation 1 mark each x 3 =	3 marks	
	ii.	2 marks for each diagram x 3 =	6 marks	**6**
OR	iii.	Definition	1 mark	**6**
		2.5 marks for each mechanism x 2 =	5 marks	
Q.4	i.	1 mark for each definition		**2**
	ii.	Hume Rothary rule	3 marks	**3**
	iii.	TTT diagram	3 marks	**5**
		Microstructure naming	1 mark	
		Explanation	1 mark	
OR	iv.	Well labelled Diagram	3 marks	**5**
		Equations , temperature and composition	2 marks	
Q.5	i.	2 marks (for each alloy) x 2 =	4 marks	**4**
	ii.	1.5 marks (for each type of C.I.) x 4 =	6 marks	**6**
OR	iii.	Stainless steel	3 marks	**6**
		Nickel based alloy	3 marks	

Q.6

	i.	Definition	1 mark	**5**
		Application	2 marks	
		Properties	2 marks	
	ii.	Classification with explanation	3 marks	**5**
		Application	1 mark	
		Properties	1 mars	
OR	iii.	Definition	1 mark	**5**
		Types	2 marks	
		Properties	2 marks	

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