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

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2022

EN3ES25 Engineering Materials

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

Q.1 i. γ-Iron has..... Crystal structure. **1**
(a) HCP (b) FCC (c) BCC (d) SCC

ii. Orthorhombic crystal system has axial Relationship as- **1**
(a) a=b=c (b) a=b≠c (c) a≠b≠c (d) None of these

iii. _____ is usually defined as resistance of a material to penetration. **1**
(a) Tensile strength (b) Compressive strength
(c) Hardness (d) Fatigue strength

iv. The ability of a material to absorb energy when deform elastically and dissipate it when the load is removed. **1**
(a) Malleability (b) Porosity
(c) Stiffness (d) Resilience

v. In Gibbs phase rule, Number of variables that can be independently changed without altering the state of the system is: **1**
(a) Degree of solubility (b) Degree of Freedom
(c) No. of Component (d) None of these

vi. _____comprise of alternate layers of ferrite and cementite in steel. **1**
(a) Austenite (b) Pearlite (c) Ledeburite (d) None of these

vii. Bronze is an alloy of- **1**
(a) Lead and Tin (b) Copper and Tin
(c) Copper and Zinc (d) Nickel and Zinc

viii. What is full form of HSLA? **1**
(a) High Steel Low Aluminium (b) High-strength, low-alloy
(c)High Sulphur Low Aluminium (d) None of these

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

P.T.O.

x. ABS stand for- **1**
(a) Anode based styrene (b) Anode based system
(c) Acrylonitrile butadiene styrene (d) None of these

Q.2 i. Draw the miller indices for given indices- **3**
(a) [0 0 1] (b) [1 1 1] (c) (1 1 1)

ii. Draw the unit cell for SCC and FCC crystal structure. Discuss the number of atoms, coordination number and atomic packing factor for both unit cells. **7**

OR iii. Classify crystal imperfection and explain point defect in detail. **7**

Q.3 i. Draw labelled stress-strain diagram for ductile material, brittle material, ceramic, and polymer. **4**

ii. Explain the any two methods of strengthening of metals. **6**

OR iii. Explain any six mechanical properties of engineering materials. **6**

Q.4 i. Explain allotropy nature of Iron with diagram. **3**

ii. Draw neat and clean Iron-iron carbide metastable phase diagram indicating various temperature, carbon-content and various zones. Write three important reactions also. **7**

OR iii. Draw and explain TTT diagram. Explain Hume Rothery rule for solid solution. **7**

Q.5 i. Classify cast-iron. Explain any one type in details. **4**

ii. (a) Classify ferrous materials with examples. **6**
(b) Explain TRIP Steel (Composition, properties, and application).

OR iii. Write composition, properties, and application of two important Nickel based alloys. **6**

Q.6 Attempt any two:

i. Differentiate between thermoplastic polymers and thermosetting Polymers. **5**

ii. What are the General properties and application of carbon nano tubes? **5**

iii. Write brief note on - **5**
(a) Shape memory alloy (b) Ceramics

******

Marking Scheme
EN3ES25 Engineering Materials

Q.1	i)	(b) FCC	**1**
	ii)	(c) a≠b≠c	**1**
	iii)	(c)Hardness	**1**
	iv)	(d) Resilience	**1**
	v)	(b) Degree of Freedom	**1**
	vi)	(b)Pearlite	**1**
	vii)	(b) Copper and Tin	**1**
	viii)	(b) High-strength, low-alloy	**1**
	ix)	(c) Amorphous	**1**
	x)	(c) Acrylonitrile butadiene styrene	**1**

Q.2 i. Draw the miller indices for given indices- **3**
(a) [0 0 1] (b) [1 1 1] (c) (1 1 1)
1 mark for each

ii. Draw the unit cell for SCC and FCC crystal structure. Discuss the number of atoms, coordination number and atomic packing factor for both unit cells. **7**
1 mark for unit cell diagram for SCC and FCC

MARKS	2 MARKS	2 MARKS	2 MARKS
Unit cell	**Number of atoms**	**CN**	**APF**
SCC	1	6	~52 %
FCC	4	12	~74 %

OR iii. Classify crystal imperfection and explain point defect in detail. **7**
Classification - 2 marks
Explanation of five types of point defect with diagram – 5 marks

Q.3 i. Draw labelled stress-strain diagram for ductile material, brittle material, ceramic and polymer. **4**
1 mark for each

ii. Explain the any two method of strengthening of metals. **3,3**
3 mark for each method

OR iii. Explain any six mechanical properties of engineering materials. **6**
1 mark for each

Q.4 i. Explain allotropy nature of Iron with diagram. **3**
Explanation 1 mark
Diagram 2 marks

ii. Draw neat and clean Iron-Iron carbide metastable phase diagram indicating various temperature, carbon-content and various zones. Write three important reactions also. **7**
Correct diagram indicating correct zones - 2 marks
Correct temperatures - 1 mark
Correct compositions - 1 mark
Three important reaction - 3 marks

OR iii. Draw and explain TTT diagram. Explain Hume Rothery rule for solid solution. **7**
4 marks for TTT Diagram
3 marks for Hume Rothery rule

Q.5 i. Classification 2 Marks **4**
Any one type of cast iron 2 Marks

ii. a) Classify ferrous materials with examples. **3,3**
b) Explain TRIP Steel (Composition, properties and application)
Classification of ferrous materials - 3 marks
TRIP Steel – 3 marks

OR iii. Write composition, properties and application of two important nickel based alloys. **6**

Name of alloy	**composition**	**properties**	**application**
Alloy 1	1 mark	1 mark	1 mark
Alloy 2	1 mark	1 mark	1 mark

Q.6 Attempt any two:

i. Differentiate between thermoplastic polymers and thermosetting Polymers. **5**
1 Mark each
(1 Mark*5)

ii. What are the General properties and application of carbon nano tubes? **5**
2.5 marks for properties (minimum 2 properties)
2.5 marks for application (minimum 2 application)

iii. Write brief note on - **5**
(a) Shape memory alloy (b) Ceramics
2.5 marks for each

******