Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination Dec 2024

EN3ES25 Engineering Materials

Programme: B.Tech. Branch/Specialisation: 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.

			Marks	BL	PO	CO	PSO
Q.1	i.	{211} represents miller indices of_____. (a) Single line (b) Single plane (c) Family of line (d) Family of planes	**1**	01	01 12	01	
	ii.	In case of edge dislocation, Burger's vector is- (a) Incline with dislocation (b) Parallel to dislocation (c) Perpendicular to dislocation (d) None of these	**1**	01	01 12	01	
	iii.	_____ is the formation of a new set of strain-free and equiaxed grains that have low dislocation densities. (a) Age hardening (b) Work hardening (c) Recrystallization (d) None of these	**1**	02	01 12	02	
	iv.	Hooke's Law applicable up to _____. (a) Proportional point (b) Yield point (c) Ultimate point (d) Fracture point	**1**	01	01 12	02	
	v.	In Gibbs phase rule, Number of variables that can be independently changed without altering the state of the system is- (a) Degree of solubility (b) Degree of freedom (c) No. of component (d) None of these	**1**	01	01 12	03	

vi.	_____comprise alternate layers of ferrite and cementite in steel. (a) Austenite (b) Pearlite (c) Ledeburite (d) None of these	**1**	01	01 12	03
vii.	Monel alloys consist of _____. (a) Cu + Zn (b) Cu + Sn (c) Cu + Fe (d) Cu + Ni	**1**	01	01 12	04
viii.	Brass is an alloy of _____. (a) Lead and Tin (b) Copper and Tin (c) Copper and Zinc (d) Nickel and Zinc	**1**	01	01 12	04
ix.	Structure of common glass is _____. (a) Crystalline (b) Amorphous (c) Metallic (d) None of these	**1**	01	01 12	05
x.	Silicon carbide is chemically _____ refractory. (a) Neutral (b) Basic (c) Acidic (d) None of these	**1**	01	01 12	05

Q.2	i.	Differentiate between covalent and ionic bonding.	**2**	01	01 12	01
	ii.	What are miller indices? Write the procedure for finding out miller indices for planes. Also, draw the miller indices for given indices- (a) [1 0 0] (b) [1 1 1] (c) (1 1 1)	**8**	02	01 12	01
OR	iii.	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.	**8**	02	01 12	01
Q.3	i.	Define creep and fatigue failure.	**2**	01	01 12	02
	ii.	Explain any eight mechanical properties of engineering materials.	**8**	02	01 12	02
OR	iii.	Write short notes on the following- (a) Mechanism of plastic deformation (b) Strengthening mechanism	**8**	02	01 12	02

Q.4	i.	Classify various heat treatment processes.	**3**	02	01 12	03
	ii.	Draw TTT diagram. Explain its important regions.	**7**	02	01 12	03
OR	iii.	Draw the iron-iron carbide equilibrium diagram neatly and label the entire region.	**7**	02	01 12	03
Q.5	i.	Classify cast-iron.	**4**	02	01 12	04
	ii.	Explain the effect of various alloying elements in a steel.	**6**	02	01 12	04
OR	iii.	Write short notes on the following- (a) Properties, composition and applications of Ni-based super alloys. (b) Properties, composition and applications of copper based alloy.	**6**	02	01 12	04
Q.6		Attempt any two:				
	i.	What do you mean by ceramics? Write informative notes on WC and CBN.	**5**	02	01 12	05
	ii.	Define the term composite. Explain its types.	**5**	02	01 12	05
	iii.	Explain the types of polymers. Also write application of polymers.	**5**	02	01 12	05

******

Marking Scheme
EN3ES25(T) Engineering Materials

Q.1	i)	(d) Family of planes		**1**
	ii)	(c) Perpendicular to dislocation		**1**
	iii)	(c) Recrystallization		**1**
	iv)	(a) Proportional point		**1**
	v)	(b) Degree of Freedom		**1**
	vi)	(b) Pearlite		**1**
	vii)	(d) Cu + Ni		**1**
	viii)	(c) Copper and Zinc		**1**
	ix)	(b) Amorphous		**1**
	x)	(a) Neutral		**1**
Q.2	i.	Differentiate between Covalent and Ionic bonding.		**2**
		1 marks for each difference		
	ii.	What are miller indices? Write the procedure for finding out miller indices for planes. Also, draw the miller indices for given indices- (a) [1 0 0] (b) [1 1 1] (c) (1 1 1) Definition of miller indices - 2 mark Procedure - 3 marks drawing miller indices - 1 mark each * 3 = 3 Marks		**8**
OR	iii.	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. 4 marks for SCC - Draw the unit cell, No. of Atoms,C.N., APF 4 marks FCC- Draw the unit cell, No. of Atoms,C.N., APF		**8**
Q.3	i.	Define Creep and fatigue failure.		**2**
		1 marks for Each		
	ii.	Explain various Mechanical Properties of Engineering Materials. (Any Eight)		**8**
		1 marks for Each		
OR	iii.	Write short notes on the following- a)Mechanism of plastic deformation b)Strengthening mechanism 4 marks for each		**8**
Q.4	i.	Classify various heat treatment processes.		**3**
		classification - 3 marks		
	ii.	Draw a typical equilibrium diagram for an Isomorphous system and explain the equilibrium cooling with change in structure of any one alloy from the above diagram. Correct diagram indicating correct zones - 2 marks Correct temperatures - 1 mark equilibrium cooling with change in structure of any one alloy - 4 marks		**7**
OR	iii.	Draw the iron-iron carbide equilibrium diagram neatly and label the entire region. Correct diagram indicating correct zones - 4 marks Correct temperatures - 1.5 mark Correct compositions - 1.5 mark		**7**
Q.5	i.	Classify cast-iron.		**4**
		4 marks for four types of cast iron		
	ii.	Explain the effect of various alloying elements in a steel.		**6**
		1 mark for each alloying element		
OR	iii.	Write short notes on the following- b)Properties, composition and applications of Ni-based super alloys c)Properties, composition and applications of copper based alloy 3 marks for each		**6**

P.T.O.

Q.6 Attempt any two:

i. What do you mean by ceramics? Write informative notes on WC and CBN. **5**

Definition and types of Ceramics - 2 marks
1.5 marks for WC, 1.5 marks for CBN

ii. Composites are future materials. Justify this statement. **5**

Explanation - 5 marks

iii. What are the General properties and application of carbon nanotubes? **5**

2.5 marks for properties (minimum 2 properties)
2.5 marks for application (minimum 2 application)

******