B.TECH/ME/3RD SEM/MECH 2104(BACKLOG)/2021

ENGINEERING MATERIALS (MECH 2104)

Time Allotted : 3 hrs

Full Marks: 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and <u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A (Multiple Choice Type Questions)

1.	Choose the correct alternative for the following:				$10 \times 1 = 10$	
	(i)	Which of the following bond is the weakest? (a) Ionic bond (c) Metallic bond		, (b) Covalent bond (d) Secondary di-p	(b) Covalent bond (d) Secondary di-pole bond.	
	(ii)	Magnesium present in the alloy steel increases (a) ductility (c) toughness		ses the property of (b) hardness (d) brittleness.		
	(iii)	Which of the following is magnetic allotrope of (a) α –iron (c) ɣ - iron		e of iron? (b) β- iron (d) δ - iron		
	(iv)	The equation n=2d sinθ represents (a) Bragg's law (c) Atomic packing factor		(b) Miller indices (d) lattice parame	ter.	
	(v)	Paralite is a mixture (a) ferrite (c) bainite	of cementite and	(b) austenite (d) martensite.		
	(vi)	Atomic packing facto (a) 0.64	or of a face centered cub (b) 0.54	e is equal to (c) 0.74	(d)0.84.	
	(vii)	Number of atoms present per unit cell of a HCP crystal is(a) 1(b) 6(c) 4(d) 2.				
	(viii)	Strain hardening improves (a) static tensile strength (c) fatigue life		(b) steady state cr (d) ductility.	(b) steady state creep rate (d) ductility.	

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- (ix) Austenite in steel when rapidly cooled (quenched) from recrystallisation temperature forms
 (a) pearlite
 (b) bainite
 (c) martensite
 (d) ferrite.
- (x) Gibbs phase rule for condensed state reaction under constant pressure is (a) F+P = C+2 (b) F+C = P+2(c) F+P = C+1 (d) F+1 = C+P.

Group-B

- 2. (a) Discuss the differences between the slip and twinning mechanism for plastic deformation of metals.
 - (b) Explain with a neat sketch the occurrence of slip by the movement of edge dislocation.

6 + 6 = 12

- 3. (a) Mention the major differences between ionic bonding, covalent bonding and metallic bonding.
 - (b) Obtain the Miller Indices of a plane whose intercepts are "a", "b/2" and 3c on x, y and z axes respectively in a simple cubic unit cell.

6 + 6 = 12

Group - C

- 4. (a) Define and explain Annealing process and state its objectives.
 - (b) Mention the properties of tool steel.

6 + 6 = 12

- 5. (a) Write short notes on (i) pearlite (ii) cementite
 - (b) Name any two ferrous alloys mentioning their compositions, properties and applications.

6 + 6 = 12

Group - D

- 6. (a) Mention various factors that affect the mechanical properties of a metal.
 - (b) Define Young's modulus and Poisson's ratio. The Young's modulus and Poisson's ratio of a material are 210 GN / m² and 0.3 respectively. Determine the shear modulus of the material.

6 + 6 = 12

- (a) Differentiate between true strain and engineering strain. The engineering stress and strain at fracture were found to be 450 MPa and 0.63 respectively. Determine true stress and true strain.
 - (b) A fatigue test was conducted in which the mean stress was 70 MPa and the stress amplitude was 210 MPa. Compute the following : (i) the maximum and minimum stress levels (ii) stress ratio (iii) stress range & (iv) the total stress.

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Group – E

- 8. (a) Define corrosion and explain the different mechanisms of corrosion.
 - (b) Discuss any two types of corrosion.

6 + 6 = 12

- 9. (a) What are ceramic materials? State the advantages of ceramic materials.
 - (b) Describe in brief the properties and the importance of plastics in Engineering Applications.

(2+4)+6=12

Department & Section	Submission Link
ME	https://classroom.google.com/c/NDY4Mjc0MjMzODAx?cjc=nzqa3ef