Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – WINTER 2021

Subject Code:2131904 Date:21-02-2022

Subject Name:Material Science & Metallurgy

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Naturally occurring Gold has an FCC structure and has a density of 19.3g/cm^3. The atomic mass of gold is 197g/mol. Calculate the atomic radius of gold.	**03**
	(b)	Name at least one application of following engineering properties of material. (i) Hardness (ii) Toughness (iii) Creep Strength (iv) Plasticity (v) Stiffness	**04**
	(c)	Write the procedure for Jominy end quench practical and discuss its conclusion.	**07**
Q.2	**(a)**	Write full names of following acronyms: BHN ; AISI ; TTT	**03**
	(b)	Draw cooling curve of (i) pure metal and (ii) An alloy of two metals which are completely soluble in liquid and solid phase	**04**
	(c)	Explain and differentiate Edge dislocation and Screw dislocation with neat sketch.	**07**
		OR	
	(c)	Describe principle, advantages, limitations and applications of ultrasonic inspection.	**07**
Q.3	**(a)**	State composition and specific applications of : Muntz metal ; German silver ; Naval brass	**03**
	(b)	What is Gibb's phase rule? Calculate the degree of freedom, for eutectic composition in binary phase diagram.	**04**
	(c)	With the aid of an iron- iron carbide equilibrium diagram. Show and explain eutectic, peritectic and eutectoid transformation. Also mention the significance of these transformations	**07**
		OR	
Q.3	**(a)**	Discuss the effect of adding nickel and chromium to steels.	**03**
	(b)	List the characteristics required in dye material for dye penetration testing.	**04**
	(c)	What is phase diagram? Explain Lever rule.	**07**
Q.4	**(a)**	Explain in Brief "Types of Diffusion"	**03**
	(b)	Explain imperfections in crystal with neat sketches.	**04**
	(c)	Which are various surface hardening processes? Explain induction hardening process with sketch	**07**
		OR	
Q.4	**(a)**	What do you mean by allotropy of metal? Discuss allotropy of Iron	**03**
	(b)	Differentiate between Annealing process and Normalizing process.	**04**
	(c)	Define critical cooling Rate of steel and show the same on a TTT diagram with labels	**07**
Q.5	**(a)**	Explain the mechanism of twining with suitable sketches	**03**
	(b)	State Hume -Rothery rules for solid solution	**04**
	(c)	Which are the merits and demerits and application of powder metallurgy	**07**
		OR	
Q.5	**(a)**	Define Unit cell and draw (111) and [101]	**03**
	(b)	Enlist methods of manufacturing metal powder. Discuss any one in detail	**04**
	(c)	Describe principle, procedure and use of X-Ray Radiography	**07**

****