Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3131904 Date:19-02-2022

Subject Name:Material Science and 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.**

Q 1	**(a)**	Differentiate between macro and micro examinations.	**03**
	(b)	Define: (1) Toughness (2) Hardness (3) Hardenability (4) Malleability	**04**
	(c)	Discuss selection criteria for materials used in engineering applications.	**07**
Q 2	**(a)**	Explain a atomic packing factor.	**03**
	(b)	Calculate the APF for BCC and FCC structures.	**04**
	(c)	Discuss mechanisms of quenching of steel. State the advantages and drawbacks of water & oil as quenching media.	**07**
		OR	
	(c)	Explain the different methods for Grain size measurement.	
Q 3	**(a)**	What is phase diagram?	**03**
	(b)	Explain Lever rule.	**04**
	(c)	What is Gibb's phase rule? Define system, phase and degree of freedom. Show that the degree of freedom at eutectic point in a binary phase diagram is zero.	**07**
		OR	
Q 3	**(a)**	What is significance of soaking time provided in annealing or hardening?	**03**
	(b)	What is a eutectic, eutectoid and peritectic reaction.	**04**
	(c)	Draw iron- carbon diagram and mention all major elements.	**07**
Q 4	**(a)**	Write in brief: Hastelloy material.	**03**
	(b)	Give a few applications of copper alloys.	**04**
	(c)	Describe effect of quenching media on properties of steel during heat treatment.	**07**
		OR	
Q 4	**(a)**	What is the main objectives of NDT method?	**03**
	(b)	Explain briefly the two methods of finding carbon percentage in steels.	**04**
	(c)	Explain the effect of Grain size on the properties of metals.	**07**
Q 5	**(a)**	Explain cathodic protection against corrosion.	**03**
	(b)	Explain any one methods for production of metal powders.	**04**
	(c)	What is powder metallurgy? State the applications of powder metallurgy.	**07**
		OR	
Q 5	**(a)**	Draw Jominy hardenability set-up including labeling & important dimensions.	**03**
	(b)	Explain difference between dry type and Wet type corrosion.	**04**
	(c)	Explain the NDT method widely used for inspection of castings.	**07**

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