Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VIII (NEW) EXAMINATION – WINTER 2020

Subject Code:2182102 **Date:25/01/2021**

Subject Name:Material selection and Failure Analysis

Time:02:00 PM TO 04:00 PM **Total Marks: 56**

Instructions:

1. **Attempt any FOUR questions out of EIGHT questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1	**(a)**	Explain the concept of resource base.	**03**
	(b)	Discuss the relationship between material processing and selection of materials.	**04**
	(c)	Draw and explain the importance of stress strain curve in selection of materials; also highlight the data obtained from the curve.	**07**
Q.2	**(a)**	Discuss various factors affecting the cost of raw material.	**03**
	(b)	Define stiffness? Discuss the criteria for selection of materials for stiffness.	**04**
	(c)	Explain various criteria for the selection of material used in tools.	**07**
Q.3	**(a)**	Discuss briefly on material selection for gear applications.	**03**
	(b)	What are the various potential failure modes of ball bearing component?	**04**
	(c)	Discuss in detail mechanism of ductile failure.	**07**
Q.4	**(a)**	Differentiate between ductile and brittle fracture in metals.	**03**
	(b)	Describe the role of toughness in material selection.	**04**
	(c)	Explain the selection process of a material used for ship hull application.	**07**
Q.5	**(a)**	Draw a typical S-N curve for plain carbon steel.	**03**
	(b)	Discuss mechanism of component failure by galvanic corrosion.	**04**
	(c)	Discuss a case study on aircraft component failure due to metallurgical factors/failure of metals.	**07**
Q.6	**(a)**	Discuss the applicability of high strength to weight ratio materials in aerospace applications.	**03**
	(b)	Explain in brief about thermal fatigue.	**04**
	(c)	Explain macro & micro fracture features of Fatigue failure.	**07**
Q.7	**(a)**	Discuss in brief about corrosion fatigue.	**03**
	(b)	Explain in brief about the modes of fracture.	**04**
	(c)	Explain stress corrosion cracking in detail.	**07**
Q.8	**(a)**	What is ductile to brittle transition temperature? How the crystal structure of a metal affects this temperature?	**03**

(b) Explain the mechanism of hydrogen induced cracking in the steels. **04**

(c) What is the importance of failure analysis and its relationship with material selection? **07**

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