

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**
