

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER-VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3172114

Date:07-12-2024

Subject Name: Failure Analysis

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) What are the primary aims of failure analysis in engineering?	03
	(b) List common causes of premature failure in metallic components.	04
	(c) Describe the process of visual inspection as a failure analysis	07
Q.2	(a) Explain how stress concentration can lead to the failure of metallic structures.	03
	(b) What role does material selection play in preventing premature failures?	04
	(c) Analyze the factors responsible for premature failure of metallic structures, including design flaws, material defects, and operational stresses. Provide real-world examples.	07
	OR	
	(c) Write procedural steps for failure investigation of a component.	07
Q.3	(a) Discuss how environmental factors can accelerate wear failure in metallic components.	03
	(b) List two common mechanisms that cause wear failure	04
	(c) Explain the mechanisms behind creep failures and provide examples of where these types of failures are commonly encountered.	07
	OR	
Q.3	(a) Explain yielding phenomena in mild steel.	03
	(b) What is the key difference between ductile and brittle failure?	04
	(c) Explain the mechanisms behind fatigue failures and provide examples of where these types of failures are commonly encountered.	07
Q.4	(a) What is pitting corrosion, and why is it considered a localized form of corrosion?	03
	(b) Explain the difference between pitting corrosion and crevice corrosion.	04
	(c) Explain mechanism of crevice corrosion, its common locations, and effects on structural integrity.	07
	OR	
Q.4	(a) What is intergranular corrosion? How it can be prevented?	03
	(b) Describe the conditions that promote intergranular corrosion.	04
	(c) Explain mechanism of Hydrogen embrittlement, provide real-world examples of its occurrence.	07

- Q.5 (a)** What are the common types of failures caused by improper heat treatments? **03**
- (b)** How can overheating during heat treatment lead to failure in metals? **04**
- (c)** Discuss any case study related to welding of component which was failed during service condition. **07**

OR

- Q.5 (a)** How fracture is different from a failure? **03**
- (b)** Briefly explain how residual stresses from welding can cause failure in metal structures. **04**
- (c)** Analyze how faulty heat treatments, such as improper tempering or quenching, affect the mechanical properties of metals and contribute to early failure. Provide examples of specific failures caused by these issues **07**
