Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)
B.E. (Full Time) - END SEMESTER EXAMINATIONS, JAN. / MAY 2025

MATERIALS SCIENCE AND ENGINEERING
ML5403 & MECHANICAL BEHAVIOUR OF MATERIALS
(Regulation 2019)

Time: 3hrs Max.Marks: 100

CO1	Identify the role of dislocations and the mechanisms of plastic deformation..
CO2	Explain the strengthening mechanisms of polycrystalline and composite materials.
CO3	Analyze the nature of fracture and its underlying mechanism.
CO4	Appraise the micro-mechanics, factors and life predictions of components under fatigue loading.
CO5	Assess the behavior of materials under high temperature, metallurgical factors and life prediction of high temperature materials.

PART- A (10x2=20Marks)

(Answer all Questions)

Q.No	Questions	Marks	CO	BL
1	Draw engineering stress-strain diagram for steel, cast iron, ceramics and glass?	2	1	L3
2	What are the dislocation sources?	2	1	L1
3	How the equiaxed structure varies after cold working?	2	2	L3
4	Show yield point phenomena for low carbon steel?	2	2	L2
5	Distinguish between Izod and Charpy impact test?	2	3	L1
6	Define fracture toughness?	2	3	L2
7	Define endurance limit?	2	4	L2
8	What are the structural changes occur during fatigue failure?	2	4	L2
9	Write Larson-Miller equation and its use?	2	5	L1
10	What are the structural changes occur during creep failure?	2	5	L2

PART- B (5x 13=65Marks)

Q.No	Questions	Marks	CO	BL
11 (a)	Analyze plastic deformation and their mechanisms. Explain the role of dislocation in the plastic deformation process? 9 + 4	13	1	L4
	OR			
11 (b)	Explain the stress field and energies of dislocations? What are the methods being there to observe the dislocations? 9 + 4	13	1	L2
12 (a)	Discuss about Hall-Petch strengthening contribution and analyze '*k*' value's importance. 9 + 4	13	2	L4
	OR			
12 (b)	Explain the work hardening phenomenon and solid solution strengthening with respect to dislocations. 7 + 6	13	2	L2

13 (a)	Write Griffith's theory and derive equation for maximum stress.	**13**	3	L2
	OR			
13 (b)	What is DBTT? Discuss the factors affecting DBTT and how to determine the DBTT?	**13**	3	L2
14 (a)	Analyze the differences between high cycle and low cycle fatigue?	**13**	4	L4
	OR			
14 (b)	Write about fatigue crack growth behavior and derive equation for number of cycles to failure from Paris equation. 6 + 7	**13**	4	L2
15 (a)	Describe creep deformation stages using creep curves and deformation behavior using deformation mechanism maps? 7 + 6	**13**	5	L3
	OR			
15 (b)	Write about superplasticity and its importance. Also write about the requirements for superplastic forming.	**13**	5	L2

PART- C (1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No	Questions	Marks	CO	BL
16.	Analyze the role of precipitates in improving the strength of Al-Cu alloys?	**15**	2	L4

Endnote:

CO – Course Outcome; BL – Blooms' Taxonomy Level (L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating, and L6 – Creating); PO – Program Outcome; PI – Performance Indicator (Ref: AICTE-Examination Reform Policy, 2018)