O.P.Code:23ME0305	R23	H.T.No.									

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech. II Year I Semester Regular & Supplementary Examinations November-2025

MATERIAL SCIENCE AND METALLURGY

(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 70**

PART-A

(Answer all the Questions **10 x 2 = 20** Marks)

1	a	Describe the Phase diagram and also Write the types of phase diagrams.	CO1	L2	2M
	b	What is the unit cell?	CO1	L1	2M
	c	Differentiate steel and cast iron. Write any two types of steels and cast irons.	CO2	L2	2M
	d	What is the super alloy?	CO2	L1	2M
	e	What are TTT diagrams?	CO3	L1	2M
	f	Explain hardening process.	CO3	L2	2M
	g	What are cermets? Give examples.	CO4	L1	2M
	h	Why powder metallurgy is required for ceramics?	CO4	L1	2M
	i	Why pre-sintering is needed?	CO5	L2	2M
	j	Differentiate between crystalline and non-crystalline ceramics.	CO5	L2	2M

PART-B

(Answer all Five Units **5 x 10 = 50** Marks)

UNIT-I

2	a	What are the various types of solid solutions?	CO1	L1	5M
	b	Draw a neat sketch of BCC crystal structure and calculate its packing factor, coordinate number.	CO1	L4	5M

OR

3	a	What is the Hume Rothery, s rules? Discuss in detail.	CO1	L2	5M
	b	Construct a phase diagram and explain briefly and list out different types of phase diagrams.	CO1	L6	5M

UNIT-II

4	a	What are the properties and characteristics of stainless steel?	CO2	L1	5M
	b	List out nonferrous and precious nonferrous metals. Describe the use of nonferrous metals alloys.	CO2	L1	5M

OR

5	a	Give a composition of malleable cast iron. List out applications of malleable cast Iron.	CO2	L1	5M
	b	Classify the ferrous metals and explain ductile cast iron composition and its properties.	CO2	L2	5M

UNIT-III

6	a	Explain the toughness . How it is measured and explain their types?	CO3	L2	5M
	b	Explain about various Hardening process for alloys.	CO3	L2	5M

OR

7	a	Draw a diagram of critical cooling rate on TTT diagram and briefly explain it.	CO3	L1	6M
	b	Discus in details about heat treatment process of steel.	CO3	L2	4M

UNIT-IV

8	a	Elaborate the electrolytic deposition in powder metallurgy.	CO4	L1	6M
	b	Write a note on reduction in powder metallurgy.	CO4	L2	4M

OR

9	a	Why pre- sintering is required before Sintering process?	CO4	L2	5M
	b	Explain Sintering and their types.	CO4	L2	5M

UNIT-V

10	a	What is the polymer? Explain the polymer matrix composite.	CO5	L1	5M
	b	What are the applications of fiber reinforced composites?	CO5	L1	5M

OR

11	a	Define composite material. Explain the function of matrix, reinforce phases.	CO5	L1	5M
	b	Classify the composites based on reinforcements and matrix materials.	CO5	L2	5M

***** END *****