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

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

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

MATERIALS SCIENCE AND ENGINEERING

IV Semester

MS23404 & POWDER METALLURGY

(Regulation 2023)

Time: 3hrs Max.Marks: 100

CO1	Classify the various powder production methods and the Powder conditioning treatments.
CO2	Synthesize and correlate the characteristics of metal powders with that of the size, shape and nature of the powders.
CO3	Compare the different compaction processes and identify a suitable compaction methodology for a component meant for specific application
CO4	Explain the sintering mechanisms and the various types of Sintering processes as well as the finishing processes and evaluate the quality of formed and sintered components
CO5	Discuss the applications of various powder metallurgy components.

PART- A (10x2=20Marks)

(Answer all Questions)

Q.No	Questions	Marks	CO	BL
1	Powder metallurgy was known as metal ceramics. What similarities and difference exist between the two fields based on this name?	2	1	L3
2	Which production conditions favor the formation of spherical particle using water atomization?	2	1	L2
3	What are the limitations associated with sieve analysis?	2	2	L1
4	How the mixed particles of alumina and zirconia are separated from one another?	2	2	L3
5	Distinguish between wet bag and dry bag method?	2	3	L1
6	List the differences between the functions of a lubricant and a binder?	2	3	L2
7	What are the differences between sintering and consolidation?	2	4	L2
8	Which are the materials consolidated using reactive sintering method?	2	4	L1
9	How the nuclear waste is disposed?	2	5	L2
10	What are the advantages of microwave sintering?	2	5	L1

PART- B (5x 13=65Marks)

Q.No	Questions	Marks	CO	BL
11 (a)	Illustrate the physics behind the atomization and explain the powder production through water atomization method? (3 + 10)	13	1	L3
	OR			
11 (b)	Analyze the powder synthesis method through oxide reduction and thermal decomposition methods? (6 + 7)	13	1	L4
12 (a)	Explain the powder characterization techniques of elutriation and permeability method? 6 + 7	13	2	L2

	OR			
12 (b)	How the surface area of powder particles measured through BET method?	13	2	L3
13 (a)	Illustrate and explain the theory and mechanism of compaction through a diagram?	13	3	L3
	OR			
13 (b)	Evaluate the methods of powder rolling and tape casting?	13	3	L5
14 (a)	With respect to sintering analyze the following: (i) Stages of sintering (7) (ii) Mechanism of sintering (6)	13	4	L4
	OR			
14 (b)	Analyze, how the sintering ability is enhanced and explain any two methods of enhanced sintering?	13	4	L4
15 (a)	Illustrate the production method of WC and WC with TiC tool steels.	13	5	L3
	OR			
15 (b)	Take one specific automobile or nuclear component. Give the composition of that component and evaluate the manufacturing process through PM?	13	5	L4

PART- C (1x 15=15Marks)

(Q.No.16 is compulsory)

Q.No	Questions	Marks	CO	BL
16.	Analyze, how the nanostructured materials are sintered to get the nanostructured grain size even after sintering also?	15	4	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)