

**III B. Tech I Semester Regular Examinations, November -2025**  
**NANO TECHNOLOGY**  
(Mechanical Engineering)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question Paper consists of two parts (Part-A and Part-B)  
2. Answer ALL the question in Part-A  
3. Answer any **FIVE** Questions, each Question from each unit from **Part-B**  
4. All Questions Carry **Equal** Marks

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<b>PART-A (10x2Marks=20M)</b>			
1.	a)	Define nanotechnology and give two of its major application areas.	[2M]
	b)	What are nanostructured materials? Give two examples.	[2M]
	c)	Mention two effects of nanoscale on melting point and diffusivity.	[2M]
	d)	Distinguish between bottom-up and top-down approaches.	[2M]
	e)	What is the principle of X-Ray Diffraction (XRD)?	[2M]
	f)	List two applications of Atomic Force Microscopy (AFM).	[2M]
	g)	Define nano sensors and state one example of their use.	[2M]
	h)	Mention two challenges in large-scale nanomaterial synthesis.	[2M]
	i)	What is meant by self-assembly in nanostructure formation?	[2M]
	j)	List two nanomaterials used in the energy sector.	[2M]
<b>PART-B (5x10Marks=50M)</b>			
<b>UNIT-I</b>			
2a)		Explain the classification of nanostructured materials and their unique features. Also discuss the major challenges and future prospects of nanotechnology.	[10M]
		(OR)	
2b)	i)	Describe the history and evolution of nanotechnology.	[5M]
	ii)	Discuss the role of nanomaterials in modern engineering applications.	[5M]
<b>UNIT-II</b>			
3a)		Discuss the influence of nanoscale dimensions on the mechanical, electrical, and magnetic properties of materials.	[10M]
		(OR)	
3b)		Explain the types of microstructural defects in nanocrystalline materials and their influence on material behavior.	[10M]
<b>UNIT-III</b>			
4a)	i)	Explain the bottom-up synthesis techniques such as Sol-Gel method and Chemical Vapor Deposition.	[5M]
	ii)	Describe the top-down approaches like mechanical alloying and nano-lithography.	[5M]
		(OR)	
4b)		Discuss the consolidation techniques of nano powders such as hot isostatic pressing and spark plasma sintering.	[10M]
<b>UNIT-IV</b>			
5a)		Explain the working principles, advantages, and limitations of SEM and TEM	[10M]

		in nanomaterial characterization.	
		(OR)	
5b)	i)	Discuss the operation of AFM and STM with suitable diagrams.	[5M]
	ii)	Write short notes on XRD and Nano-indentation techniques.	[5M]
		<b><u>UNIT-V</u></b>	
6a)		Explain in detail the applications of nanomaterials in the fields of medicine, environment, and defense.	[10M]
		(OR)	
6b)		Discuss the role of nanotechnology in consumer products, agriculture, and energy sectors along with the associated concerns and challenges.	[10M]