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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: VII**
Branch: Institutional Elective **Duration: 3 hrs.**
Course Code: 17CY7IENMA **Max Marks: 100**
Course: Nano Materials – Synthesis, Characterization, Properties and Application **Date: 22.02.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1	a)	Briefly summarize the history and developments of nanostructured materials.	**8**
	b)	Discuss the classification of nanomaterials with suitable examples.	**8**
	c)	Discuss about a) Nano crystalline ceramics b) Semiconductor nanoparticles	**4**

UNIT - II

2	a)	Explain the synthesis of CNTs by Electric Arc-Discharge technique.	**8**
	b)	Explain in detail the Sol-Gel processes to prepare nanoparticles.	**8**
	c)	Explain in detail the magnetron sputtering method of synthesis of nano coatings and their relative merits.	**4**

OR

3	a)	Explain the principle of pulsed laser deposition method with a neat schematic diagram.	**8**
	b)	Discuss the principle and steps involved in the preparation of nanostructured materials by Chemical Vapor Deposition method taking suitable example.	**8**
	c)	Describe the microwave assisted synthesis of metal nanoparticles.	**4**

UNIT - III

4	a)	Define surface energy and surface stress. Is there any effect on the lattice constant on low dimension material? Explain surface stress on lattice parameter in nanomaterials.	**8**
	b)	Write in detail the effects of size reduction on magnetic properties and melting point of nanomaterials.	**8**
	c)	Discuss the effect of size on optical and catalytic properties of nanomaterials	**4**

UNIT-IV

5	a)	Explain Scherrer method in nanoparticle size analysis with a suitable X-ray diffractogram. How XRD analysis is important in nanomaterial characterization?	**8**
	b)	With a neat schematic diagram,explain structure analysis using TEM	**4**
	c)	What are the types of electrons typically involved during interactions between the electron beam and the sample in SEM? Why non-conductive samples are coated with gold SEM analysis.	**8**

OR

6	a)	Explain the working of scanning electron microscopy (SEM) with a neat sketch. Discuss about the compositional and topographic contrasts used in SEM.	**8**
	b)	What is the difference between TEM and HRTEM? Enlist the different aspects of crystallite information that can be investigated using HRTEM analysis?	**8**
	c)	What is Brags Law? Mention seven crystal systems	**4**

UNIT-V

7	a)	List out the potential applications of nanodimensional materials in biomedical science, medicine, diagnostics and water treatment.	**8**
	b)	Elaborate on potential uses of nanomaterials in the area of energy, defence, cosmetic industries and in automobile sector.	**8**
	c)	Discuss in detail the applications of nanotechnology in Electronics and communication and in sport sector.	**4**

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