

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2023****Subject Code: 3152112****Date: 13-12-2023****Subject Name: Nano Materials****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

		Marks
Q.1	(a) What are nano materials, and how are they different from other materials?	03
	(b) Classify nano materials according to their structures.	04
	(c) What are some of the most promising applications for these materials? List down some commercial products, goods, equipment using nanotechnology.	07
Q.2	(a) What are the unique properties of nanomaterials, and how do these properties affect their behavior and applications?	03
	(b) “There is plenty of room at the Bottom” –Discuss this historical statement given by Richard Feynman	04
	(c) What are the challenges and limitations in the development and commercialization of nanomaterials?	07
	OR	
	(c) Classify various types of nanostructures on the basis of their sizes, and their applications.	07
Q.3	(a) State the reason that traditional methods of metal fabrication are not applicable for fabrication of nano-materials.	03
	(b) What is the effect of high surface area to volume ratio on reactivity & strength of nanomaterials?	04
	(c) Compare Bottom-Up approach and Top-down approach with suitable examples.	07
	OR	
Q.3	(a) Draw schematic of 1D layered structure, 2D filamentary structure and 3D equiaxed particle nanostructure.	03
	(b) How microscopic to nanoscopic grain size affect the melting point of a material explain with example.	04
	(c) What effect will be on strength of material when the size falls below critical diameter of grain with reference to Hall-Petch equation?	07
Q.4	(a) Draw a schematic of any nano film deposition technique with proper label.	03
	(b) What are the advantages and disadvantages of using sol-gel synthesis for the production of nano-structured materials?	04
	(c) Describe the various Stages of powder evolution during High-energy Milling. What are the applications of the nano-grain powder. ?	07
	OR	
Q.4	(a) Draw and compare Single Wall Nanotube (SWNT) and Multi Wall nanotube (MWNT) structures.	03
	(b) Differentiate between Quantum wells, quantum wires and quantum dots with neat schematics.	04
	(c) What is superplasticity, and how is it affected by the presence of nanostructured materials?	07

- Q.5 (a)** State difference between bulk metal composite and nano composite materials. **03**
- (b)** What are the unique properties of carbon nano tubes (CNTs), such as their electrical conductivity, mechanical strength, and thermal stability, and how can these properties be exploited for various applications? **04**
- (c)** Draw schematic of ferro-magnetism, para-magnetism and di-magnetism effect and state the application of these materials in electronic industries. **07**

OR

- Q.5 (a)** What is molecular self-assembly technique of nano synthesis ? **03**
- (b)** List down some of the techniques used for characterization of the nano-materials and explain any one in brief. **04**
- (c)** Give your views in one-two sentences only. **07**

1. What could be the promising energy solutions expected from nano-technology?
2. How Nano-technology is useful for defence , society and medical science applications?
