Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3170509 Date:30-11-2024

Subject Name: Nanoscience and Technology

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.**

Q.1	**(a)**	Define nanotechnology. Who introduced the concept of nanotechnology? What is the relationship between nanometer and micrometer?	**03**
	(b)	State and explain two important properties that differentiate nanomaterials from bulk materials.	**04**
	(c)	Discuss colour generation from nanoparticles and nanostructures due to interaction with light or other reasons with examples.	**07**
Q.2	**(a)**	Explain the role of reducing agents and stabilizers in colloidal method of synthesis of nanoparticles.	**03**
	(b)	Compare and contrast the features of top-down and bottom up approaches of synthesis of nanomaterials.	**04**
	(c)	Describe spray pyrolysis method for synthesis of ceramic nanopowder.	**07**
		OR	
	(c)	Discuss Co-precipitation method for making Nano-particles.	**07**
Q.3	**(a)**	Explain the principle of Bragg's law for X-ray diffraction analysis.	**03**
	(b)	Explain the principle and working of dynamic light scattering method.	**04**
	(c)	Compare and contrast the salient features of scanning electron microscopy and transmission electron microscopy.	**07**
		OR	
Q.3	**(a)**	What is EDS analysis? State its application.	**03**
	(b)	Explain the principle of FTIR analysis. Which type of spectral information can be obtained from FTIR analysis?	**04**
	(c)	Explain Beer-Lambert law in context with UV-VIS spectroscopy. State three important applications of UV-VIS spectroscopy.	**07**
Q.4	**(a)**	Explain photocatalysis using nanomaterials.	**03**
	(b)	State and explain Stokes-Einstein relation in the context to dynamic light scattering (DLS) method for particle size distribution.	**04**
	(c)	Discuss any one method of the synthesis of carbon nanotubes (CNT). Write down important applications of CNT.	**07**
		OR	
Q.4	**(a)**	Explain the principle of molecular self-assembly of synthesis of nanomaterials in brief.	**03**
	(b)	Compare CVD and PVD methods of synthesis of nanomaterials.	**04**
	(c)	Explain various steps of chemical vapor deposition (CVD) process for synthesis of nanomaterials.	**07**
Q.5	**(a)**	Enlist names of nanocomposite polymers.	**03**
	(b)	Why nano coatings are useful in automobile industry?	**04**
	(c)	Discuss the application of nanomaterials in catalysis.	**07**

OR

Q.5	**(a)**	What are the major types of spectroscopy? Give examples for each.	**03**
	(b)	Which nanomaterials are used in fuel cell?	**04**
	(c)	Discuss the application of nanomaterials in drug delivery and diagnostics.	**07**

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