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- (iii) Define nanotoxicology and describe major factors that determine nanoparticle toxicity. (5)

6. Attempt any **three** : (5×3)

(a) Carbon nanotubes: structure and properties.

(b) Magnetic Nanoparticles for imaging and therapy.

(c) Alginate-based hydrogels.

(d) Fibre-Reinforced Composite.

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7251

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Unique Paper Code : 2173520034

Name of the Paper : DSE : Nanomaterials and Their Biological Applications

Name of the Course : **B.Sc. (Prog.)**

Semester : VIII

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **4** questions out of **6** questions.
3. **Each** question carries equal marks.
4. Use of scientific calculator and logarithmic tables is allowed.

*Attempt any **four** questions.*

1. (i) Explain the concept of surface plasmon resonance (SPR). (5)

(500)

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- (ii) Define bioinorganic nanomaterials and give three examples where inorganic components are combined with biomolecules. (5)
- (iii) Describe the principles of self-assembly. Explain strategies used to control their architecture and order with examples. (5)
- 2. (i) Define nanostructures and nanomaterials. Explain the quantum confinement, two principal consequences of nanoscale dimensions. (5)
- (ii) Define bio-nanocomposite and discuss their preparation and application. (5)
- (iii) Describe the classification and important features of inorganic nanomaterials. (5)
- 3. (i) Define hybrid hydrogels and explain why combining natural and synthetic components is advantageous. (5)
- (ii) Describe mechanisms by which hydrogels remove pollutants. Give two examples of hydrogel systems used for heavy metal removal. (5)

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- (iii) Explain how hydrogels can be used in active or intelligent food packaging with example. (5)
- 4. (i) Define metal-matrix composites and describe common fabrication methods and their application. (5)
- (ii) Describe PEGDA hydrogel formation via photopolymerization. Provide two applications where PEGDA hydrogels are widely used. (5)
- (iii) Explain the environmental effects on composite, including the role of moisture, temperature, UV light, and chemicals. (5)
- 5. (i) Explain the structure and synthesis of silica nanoparticles. Discuss how porosity, surface chemistry, and particle size are controlled. (5)
- (ii) Define quantum dots and explain size-dependent optical properties. Describe their use in bioimaging and biosensing. (5)

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