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National Institute of Technology, Hamirpur
Open Elective-I, 5th semester (B.Tech.)
End Term Exam (November, 2022)
Nanoscience and Nanotechnology (CH-370)

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Duration: 3 hrs

Max. Marks: 50

Note: This question paper consists of twelve questions and one page.

- Attempt all questions.
- Answer the questions precisely to the point

Q1. Attempt the following;

[7+2+1+5 = 15]

- (a) Consider a sphere with diameter of 1 μm . If this same mass of sphere is converted through a size reduction process to spheres with diameter 1 nm, calculate the increase in surface-area-to-volume ratio of smaller sized spheres. [7]
- (b) How many cubes 1 nm on each side can be carved out of a cube 1 m on each side? Find out the collective surface area of the nanometre-sized cubes. [2]
- (c) Write down complete set of chemical reaction involves in gel formation by sol gel method. [1]
- (d) Explain the X-ray lithography along with all the process steps and diagram. [5]

Q2. Attempt the following;

[6+4 = 10]

- (a) Write down the list of all synthesis methods used to synthesized nanomaterials and explain any one in details with neat sketch and notations. [6]
- (b) What is CNTs? Explain the formation of CNTs to graphene with neat sketch and notations. [4]

Q3. Attempt the following;

[15+10 = 25]

- (a) Draw the neat sketch with brief explanation of working process of the following; [3 \times 5=15]
- (i) X-Ray diffraction (XRD), (ii) Scanning Electron Microscopy (SEM), (iii) Transmission Electron Microscopy (TEM), (iv) Atomic Force Microscopy (AFM), (v) UV spectroscopy
- (b) Write short notes on the following; [2 \times 5=10]
- (i) Sputtering (ii) Spray pyrolysis (iii) Self-assembly (iv) Semiconductor (v) Quantum dots

-----All the Best-----