VIT AP

CAT-II

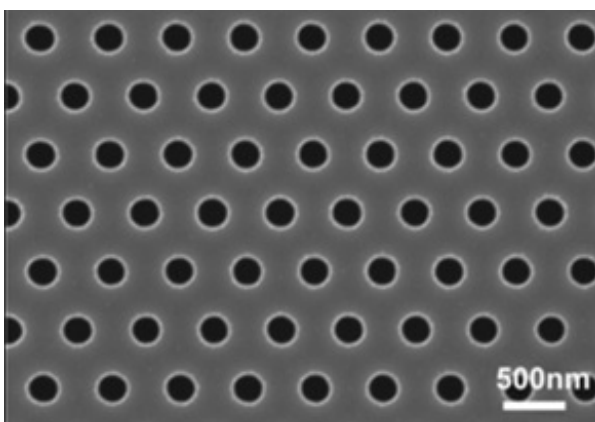## Introduction to Nanotechnology [PHY2005 - 074]

Marks: 50   **Duration: 90 mins.**

SECTON I

Answer all the questions.

1)   NanoSystem Pvt. Ltd. Company requires about 1 Kg of carbon nanotubes for device manufacturing purpose. If you are asked to meet the supply, suggest a suitable CNT synthesis method which is simple, economic and can produce cheap, good quality of CNTs.   (10)

2)   (a) What does the term 'Chirality' means? Compute the diameter and the chiral angle "θ" for a given (9,0) and (9,9) nanotube.
(b) Find the type of CNT from the list given below. Also state whether they show metallic or semiconductor property.
(i) $C_1 = 4a_1 + 9a_2$, $\theta_1 = 10°$
(ii) $C_2 = 3a_1 + 3a_2$, $\theta_2 = 30°$
(iii) $C_3 = 7a_1$, $\theta_3 = 0°$
(iv) $C_4 = 7a_2$, $\theta_4 = 0°$
(v) $C_5 = 9a_1 + 4a_2$, $\theta_5 = 23°$ (10)

3)   Describe in detail any one application sector where Buckytubes are found to serve as one of the potential material system.   (10)

4)   (a) Illustrate the requirement of functionalization of nanoparticles. What are the different ways in which it can be achieved? Also list the advantages of functionalized nanoparticles.
(b) As you know graphite and diamond both the materials are made of carbon then what is the reason that graphite is used for lubricant application and not diamond? Also discuss the possibility of transformation of graphite to diamond.   (10)

5)   Based on your knowledge on fabrication of nanomaterials suggest a suitable technique to generate the below shown image on the substrate provided to you. Discuss the complete fabrication process with a neat schematic.   (10)

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