[Time: 3 Hours] **[Marks:80]**

N.B.: 1 Question **ONE** is compulsory
2 Attempt any **THREE** questions out of the remaining
3 Figure to the right indicate full marks
4 Illustrate answers with sketches wherever required and Diagram at appropriate places carries marks
5 Assume suitable data if necessary and indicate it clearly.

1 Write short notes

(a) Explain areas of application of nanotechnology. **(05)**

(b) Describe top down and bottom up approaches for nanoparticle. **(05)**

(c) Write a short note on Sintering for fullerene synthesis. **(05)**

(d) What are special applications of carbon nanotubes? **(05)**

2 (a) With suitable diagram, explain Solar Process for fullerenes. **(10)**

(b) Compare arc discharge method, chemical vapour deposition method and laser ablation methods for CNT synthesis. **(10)**

3 a With suitable diagram explain the principle involved in X ray Diffraction. **(05)**

b Explain principle of Plasma Compaction. **(05)**

c Calculate the settling velocity of a particle moving in a gas stream. Assume the following information: $\rho_p =$ 0.899 g/cm^3 ; ρ = 0:0012 g/cm^3; **μ**(AIR) = 1.82 x 10^{-4} g/cm s; g = 980 cm/s^2 ; d_p= 0.045 mm **(10)**

4 a Define- Surface diameter, equivalent diameter, drag diameter, specific surface diameter for a particle. **(08)**

b What are the main biophysiochemical influences on the interface between nanomaterials and biological systems? **(06)**

c What are applications of nanotechnology medical field? **(06)**

5 (a) Given Inlet loading = 2 grains/ft^3, outlet loading = 0.1 grains/ft^3. Determine collection efficiency of the unit. **(05)**

(b) With suitable diagram explain principle of Laser ablation method for CNTs **(05)**

(c) Explain the method that is used to produce metal powders, especially magnetic metal or metal oxide powders. **(10)**

6 Write short notes **(any 4)**

(a) Electrical Conduction and Ohms Law **(05)**

(b) Biosystems **(05)**

(c) Crystal formation for fullerene **(05)**

(d) Applications fullerenes. **(05)**

(e) Principle of Scanning Electron Microscope **(05)**
