

OCT-2015

**M.Sc. Physics Semester - 4 Examination**  
Nanofluidics, Microfluidics and Optofluidics  
Paper No- Phys N402 Paper Code- 4757

Time : 2 Hours 30 min

Maximum Marks 70

All programs should have proper and clear comments for explanation.

1. Discuss about following terms: [14]  
(a) Nanoelectronics and its importance  
(b) Wave particle duality in quantum physics in context of nanoscience and nanotechnology  
(c) The mean free path and coherence length

OR

1. Explain in detail: Double barrier resonant tunnelling phenomena in semiconductor nano heterostructures with adequate example (at each stage figures and diagrams are compulsory) [14]  
  
2. Write a detailed note on: (a) Molecular dynamics (b) Molecular modeling (c) Computer simulation [14]

OR

2. (a) Define ab initio, mention different types of ab initio electronics structure methods [07]  
(b) Write a note on: DFT [07]  
  
3. (a) Define Electrophoresis, Explain with examples [07]  
(b) Discuss in detail: Importance to study solid liquid interface in nanostructures [07]

OR

3. (a) Write an introductory notes on MEMS and NEMS [07]  
(b) Derive Poisson Boltzman equations [07]  
  
4. (a) Write a note on, 'challenges and limitations in Magnetic fluids' [07]  
(b) Give any two stability conditions of Ferro fluids [07]

OR

4. Derive Generalize Bernoulli equation in differential and integration form and discuss its limitations briefly. [14]  
  
5. (a) Write preparation of MR fluid [07]  
(b) Write a brief note on, 'Effect of critical parameters on the ER effect' [07]

OR

5. Explain mechanism of the ER effect with any two important models [14]