

# INDIAN INSTITUTE OF TECHNOLOGY MANDI

## QUIZ – II

### Nanoscience: Understanding Small Systems (CY 342)

Full Marks: 10

Date: 23.04.2012

Time: 50 min.

#### *Answer ALL Questions:*

1. Explain what the size of the exciton Bohr radius means for achieving quantum confinement. What systems are easiest for achieving this effect? Explain why? [1+1+1]
  
2. Can 'excitons' be seen in the electronic absorption spectrum of bulk semi-conductors? Give explanation in support of your answer. [1 +1]
  
3. True or False? Also give explanations in support of your answer.
  - (a). Once an energy band is formed its width is proportional to the number of atoms in the solid. [0.5+0.5]
  - (b). The band gap of a quantum dot is directly proportional to its size. [0.5+0.5]
  - (c). A quantum dot containing thousands of atoms can be used to trap a single free electron – in effect creating a gigantic, artificial hydrogen atom. [0.5+0.5]
  - (d). When numerous atoms are brought into close proximity, only the highest occupied energy sub-level forms a band. [0.5+0.5]
  - (e). Quantum confinement relates only to those electrons that would otherwise be mobile - the conduction electrons. [0.5+0.5]