Ref. No. : EX/PG/NANO/T/129A/2024

M. Tech. in Nano Sc. & Tech. 2nd Sem. Exam – 2024

Semiconductor Nanostructures & Nanoparticles

Time: 3 hours

Full Marks: 100

Answer any ***four*** questions

1. Define melting point of any material.
   Derive an expression of melting point of a nanowire with respect to its diameter.
   How does melting point vary in amorphous material?

   3 + 12 + 10

2. Define band gap of any semiconducting material. How band gap of a semiconducting material can be varied? How band gap of bulk semiconducting material is being calculated?

   3 + 2 + 20

3. What do you mean by specific heat of any material? How different contributions to specific heat can be differentiated? Derive an expression for electronic contribution of specific heat for bulk semiconducting material. How does it depend on size of the nanoparticles?

   2 + 3 + 12 + 8

4. Derive the expression for temperature dependency of electrical conductivity of a bulk semiconductor.
   How does electrical conductivity vary in semiconductor nanostructures?

   20 + 5

5. Derive expressions for size dependency of (i) surface tension and (ii) lattice vibrational energy.

   10 + 15