

5133

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- (b) What is the classical Hall effect, and how does the resistivity vary with magnetic field? (3)

(200)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5133 J

Unique Paper Code : 2224002008

Name of the Paper : Nano Physics

Name of the Course : B.Sc. Hons. - (Physics)_NEP:
UGCF-2022

Semester : IV / VI (GE Paper)

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **four** questions in all.
3. Question No. 1 is compulsory.
4. **All** questions carry equal marks.
5. Symbols have their usual meanings.

P.T.O.

1. Attempt any five questions : (3×5=15)
- (a) What is a quantum confinement length? How does it differ from the coherence length of an electron?
 - (b) Determine the surface area to volume ratio of spherical particles of radii 1nm, 10 nm, 1μm, and plot the variation of the ratio with radii.
 - (c) Short note on sputtering technique?
 - (d) What do you understand by quantum tunneling?
 - (e) What do you mean by Excitons?
 - (f) What are carbon nanotubes? What are its various types?
2. (a) What do you mean by density of states? Derive an equation for the density of states for a 2D structure? (10)

- (b) What are MEMS and NEMS? (5)
3. (a) Describe the quantum mechanical model of a particle in a one-dimensional infinite potential well. Derive expressions for the allowed energy levels and normalized wavefunctions. (10)
- (b) What is quantum confinement, and how does it lead to the classification of nanomaterials into 0D, 1D, and 2D systems? Give examples for each type? (5)
4. (a) What are the chemical vapor deposition (CVD) techniques? Discuss any one of the CVD techniques in detail. (10)
- (b) Explain Conductance Quantization in 2D nanomaterials? (5)
5. (a) What is Coulomb blockade, and how does it arise due to charging effects? Explain how a single-electron transistor (SET) device works. (12)