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752304

December 2023

M.Sc. (Physics)-III SEMESTER

Fundamentals and Synthesis of Nanomaterials

(MPM-304)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART-A

1. (a) How nanomaterials are described? (1.5)

(b) Explain Spray Pyrolysis. (1.5)

(c) What are limitations of Lithography method? (1.5)

(d) Explain Electroplating for synthesis of Nano-materials. (1.5)

(e) Differentiate between Top down and Bottom up techniques. (1.5)

(f) Draw Electronic structure of Carbon Nano Tubes. (1.5)

(g) Describe L-B method. (1.5)

(h) Explain Quantum dot. (1.5)

(i) Draw Pulse Laser Ablation method schematic diagram. (1.5)

(j) What is microemulsion method for nanoparticle synthesis? (1.5)

PART–B

2. (a) Express quantum leak in potential step for $E < V_0$. (10)

(b) Explain the specific case of tunneling with its potential application. (5)

3. (a) Define epitaxial growth of Nanomaterials. Explain MBE method in detail. (10)

(b) Explain Sputtering method for synthesis of Nano-material. (5)

4. (a) What is the Langmuir-Blodgett method? What are the applications of Langmuir-Blodgett films? (10)

(b) What is the mechanism of hydrothermal treatment? (5)

5. (a) Explain Carbon Nano Tubes and discuss the synthesis process of CNT. (10)

(b) What are fullerenes? Explain its applications. (5)

6. (a) Describe Density of State (DoS). Prove that for 2-D materials DoS is independent of energy. (10)

(b) Explain the steps of spin and Dip coating technique to synthesis of various nanomaterials. (5)

7. Describe the following :

(i) E-beam evaporation method for deposition of nano-material.

(ii) Sol Gel Method with diagram.

(iii) Ion Beam Lithography. (3×5=15)
