

R15

Code No: 128CJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year II Semester Examinations, July - 2019

INTRODUCTION TO NANOTECHNOLOGY

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

- 1.a) Why the surface of any nanomaterial is under coordinated all the time? [2]
- b) What do you mean by Hydrophobicity? How this concept is deduced from "Lotus leaf" of nature. [3]
- c) Give few examples for Giant Magnetic Resonance (GMR) materials. [2]
- d) Define Grain Boundaries? Explain why surface energy is more at Grain boundaries. [3]
- e) What is molecular beam epitaxy (MBE) method? Is it bottom up or top down approach of nanoparticle synthesis employed. [2]
- f) What do you mean by Spark plasma sintering? Explain the working principle. [3]
- g) Why the resolution of TEM is higher than in SEM? Explain. [2]
- h) Write Debye Scherrer Formula and explain the significance of each term in the equation. [3]
- i) Distinguish bulk and nanocatalysts. [2]
- j) Will Titanium di-Oxide (TiO_2) is used in body lotions to protect from UV light exposure? Explain. [3]

PART - B

(50 Marks)

- 2.a) Nature is "best nanotechnologist"? Justify your answer with proper examples. [5+5]
 - b) Explain the Challenges and Future Prospects of Nanotechnology. [5+5]
- OR**
- 3.a) Will bulk material properties same as nanomaterial properties? If not, explain with few realistic examples.
 - b) Explain briefly the applications of Nanomaterials with examples. [5+5]
4. Discuss in detail the following in case of nanomaterials with examples. [5+5]
 - a) Electrical properties
 - b) Optical properties.
- OR**
- 5.a) How thermal properties differ from bulk to nanomaterials? Discuss the concept with a neat figure.
 - b) Write brief note on following
 - i) Dislocations
 - ii) Twins
 - iii) Stacking faults and voids. [5+5]

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6.a) What is Sol-gel? Discuss briefly the synthesis of nanoparticle via Sol-gel method with chemical reactions.

b) What is CVD? Distinguish briefly Physical and Chemical Vapor Deposition techniques. [5+5]

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7. Discuss in detail any Top down approach of nanoparticle synthesis of your choice. [10]

8. How secondary electrons will be generated? Explain the role of secondary electrons in finding the topography and morphology of nanomaterials using Scanning electron Microscopy (SEM). [10]

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9.a) What do you mean by crystallite size? How it differs from particle size? Explain briefly the determination of crystallite size using Debye Scherrer formula.

b) Explain the principle of Braggs Law in finding the diffraction pattern of crystalline materials. [5+5]

10. Discuss briefly about the following:

a) Nano.membranes used in water treatment.

b) Concerns and challenges of Nanotechnology. [5+5]

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11. Write short notes on:

a) Nanosensors

b) Nanotechnology applications in Defense and Space. [5+5]

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