R16

Code No: 135CR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, May/June - 2019
NANOTECHNOLOGY
(Common to CE, ME, ECE)

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 Nature can be considered as "best Nanotechnologist"? [2]
b) Write few Fascinating Nanostructures of your choice. [3]
c) How do you distinguish Soft and Hard magnets? Explain. [2]
d) What do you mean by disclinations? Explain the concept with example. [3]
e) Give any one example of material synthesis using Spark plasma sintering technique. [2]
f) What do you mean by Sol-gel method of nanoparticle synthesis? Explain the chemistry involved in this method. [3]
g) List the uses of electron microscopy instruments (SEM/TEM). [2]
h) Will XRD distinguish amorphous and crystalline materials? Is so, explain briefly. [3]
i) How contact angle will give information about hydrophobic and hydrophilic coatings? [2]
j) What are the uses of nano sensors? [3]

PART - B

(50 Marks)

2. Explain the present challenges of nanotechnologist. [10]

OR

3. Discuss in detail the classification of nanostructured materials. [10]

4.a) Define Diffusivity? Explain briefly with suitable examples why elastic, diffusivity properties will differ for nanomaterials to bulk materials.
b) Define Bohr exciton radius? Differentiate metals, semiconductors and insulators with the help of electronic energy diagram? Explain what will happen if the material size reaches to Bohr exciton radius. [5+5]

OR

5. Discuss in detail about the following:
a) Dislocations, Twins, stacking faults and voids
b) Grain Boundaries, triple and disclinations. [5+5]

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6. What is Lithography? What are the applications of lithography? Discuss the phenomenon of Nano-lithography with few examples. [10]

OR

7.a) Compare and contrast hot and cold iso-static pressing techniques.
b) Explain briefly spark plasma sintering with a neat diagram. [5+5]

8. Define Resolution? What are the least sizes that can be measurable from SEM and TEM? Distinguish Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) tools in characterizing the nanomaterials in detail. [10]

OR

9. Write short notes on following:
a) Field Ion Microscope (FEM)
b) Three-dimensional Atom Probe (3DAP). [5+5]

10. Define membrane. Discuss various types of nano membranes that are used in water treatment/purification techniques. [10]

OR

11. Write short notes on the following:
a) Nanosensors
b) Nanoelectronics. [5+5]

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