

M.TECH. NANO SCIENCE AND TECHNOLOGY FIRST YEAR FIRST SEMESTER – 2024

SUBJECT: SYNTHESIS OF NANOMATERIALS

Total Marks: 100 Time: 3 hours

Use separate sheets for answering each parts

Answer **Four** questions from Part-I and **One** question from Part-II

Part-I

Answer any four questions

20X4=80

1. Write about Moore's Law. Explain the Oxidation processes used in IC fabrication. Write about the different steps of Photolithography process (in details with proper diagrams) used in the fabrication of devices. 3+5+12
2. How doping of semiconductors is done in device fabrication processes? Explain the different types of etching processes used in the fabrication of devices. Explain the working principle of Molecular Beam Epitaxy (MBE) system with proper diagrams. 4+4+12
3. What is plasma? Explain the Plasma arcing process used in the synthesis of nanomaterials, with proper diagrams. Explain the operation of a Physical Vapour Deposition (PVD) system and explain the different steps involved in PVD process. 2+6+12
4. What are thin film devices? Write about the four equilibrium growth/deposition modes of thin films. Mention the different types of Chemical Vapor Deposition (CVD) Reactors. Explain the Chemical Vapor Deposition (CVD) process in details. 2+4+2+12
5. How plasma is generated and controlled in a Sputtering system? Why Magnetron Sputtering is used for the synthesis of nanomaterials? Explain the DC sputtering system with proper diagrams. 4+4+12
6. Explain the operations of thermal and electron beam (E-Beam) evaporation systems. Write about the interaction of electron beam and a sample inside a Scanning Electron Microscope. Explain the operation of an Electron Beam Lithography (EBL) system in details. 4+4+12

[Turn over

Synthesis of Nanomaterials

M. Tech NST 1st year, 1st Semester Examination 2024

Part-I I

Marks: 20

Answer one question

1. (a) What is sol-gel process for synthesis of oxide nano materials?
Describe synthesis of nano particles by sol-gel method mentioning the reactions in details.
What is the role of alcohol in this process? Discuss the effect of pH and R in the morphology and rate of the reactions.
(b) How can you synthesis silica – nickel nanocomposite by this method? 2 + 4 +2 + 6
+ 6

2. Discuss in details with mechanism, the effect of addition of acid catalyst and base catalyst in the rate of hydrolysis and condensation of sol-gel process synthesis of nanostructured silica.
5 X 4