

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – I • EXAMINATION – WINTER 2012****Subject code: 713006N****Date: 10/01/2013****Subject Name: Nano Devices Fabrication Technology****Time: 02.30 pm – 05.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** What are the types of Physical Vapor Deposition? Discuss Sputtering. **07**
(b) Discuss construction and working of Czochralsky crystallizer **07**

- Q.2 (a)** What is Etching? Discuss Wet Etching. **07**
(b) The dissolution of rate of Semiconductor MnO_2 in HBr was found to give following result, for Etching purpose. **07**

C_{AO} mol HBr/lit	0.0	0.5	1.0	2.0	4.0
$-r_{\text{AO}} \times 10^2$ molHBr/m ² Hr	0.073	0.7	1.84	4.86	12.84

Determine Specific reaction rate and Order of reaction assuming 1 mole of oxide consumes 4 mole of HydroBromic acid. Determine Etching rate in nm/min.

M.W. Mn = 55 O_2 = 32 H_2 = 2 Br_2 = 160

OR

- (b)** What is Zone refining? How and Why it is performed? **07**
- Q.3 (a)** What is Epitaxy? Discuss the mechanism of formation of Epitaxial film with reference to making of Silicon epitaxial film over Silicon Substrate. **07**
(b) Discuss construction and working of Reactors used for Chemical Vapor Deposition. **07**

OR

- Q.3 (a)** Discuss cutting and polishing of Silicon wafer. What are flats? Discuss requirement of flats for P^+ type and n^+ type junctions. **07**
(b) What are Effects of Defects on Crystal in relation to suitability of Crystal for Electronic devices? Discuss. **07**

- Q.4 (a)** Discuss Optical Projection lithography. **07**
(b) Discuss Electron beam Lithography. **07**

OR

- Q.4 (a)** What are the desired properties of Metal for Metallization? Discuss problems associated with metallization. **07**
(b) Discuss with diagram the Ion Implantation Equipment **07**

- Q.5 (a)** Discuss Pre-Oxidative cleaning. **07**
(b) Discuss various Oxidation process. Discuss dry and Wet Oxidation process. **07**

OR

- Q.5 (a)** Discuss Scanning Electron Microscopy as a tool for characterization of Nano material. **07**
(b) Gas Chromatography as an analytical tool in Nano technology. **07**
