Seat No.: _____ Enrolment No._____

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? Discus 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
$-r_{AO}$ X 10^2 molHBr/m^2Hr	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) Discus 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)** Discus Scanning Electron Microscpy as a tool for characterization of Nano material. **07**

(b) Gas Chromatography as an analytical tool in Nano technology. **07**

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