# EEL784: IC Technology
## Major Test, 2nd Semester 2007-08

April 29, 2008
Duration: 2 Hour
Maximum Marks: 55

**Note:** All questions are compulsory. **Please write neatly and make clear diagrams.**

**Question No.1**

1.1 **Briefly** outline the various parts, subsystems of an ion implanter and their role/utility/importance in ion implantation process. 10

1.2 **List precisely** the steps where the ion implanter is required to be used in a CMOS process sequence based on 1.0 micron self-aligned Si-gate technology. 5

**Question No.2**

Boron is diffused (pre-deposition step) at 950 °C for 30 minutes under solid solubility limits. This is followed by drive-in at 1150 °C for 2 hours in (10 minutes in oxygen and remaining time in nitrogen ambient). The substrate is n-type silicon having $10^{15}$ $cm^{-3}$ doping concentration.

2.1 Calculate the junction depth after pre-deposition and drive-in steps. 8

2.2 Calculate the surface concentration after drive-in step. 4

2.3 Calculate the total amount of the boron introduced after the complete diffusion cycle 4

2.4 State the assumptions made in calculations, and give justification, if any. 4

**Question No.3**

Write **precisely** the advantages and disadvantages of dry etching process in comparison with wet etching process in IC fabrication. Draw an schematic diagram of an plasma / RIE system showing all the major components. With the help of plasma potential diagram, explain what is generally understood by "plasma etching" and "Reactive Ion Etching (RIE)". Name some of the gases used in dry etching process. 10

**Question No.4**

4.1 In a multilevel metallization scheme for IC fabrication, inter-metallic dielectric layers are to be formed. State and explain the issues in selecting the materials and process for the same. 5

4.2 Discuss the deposition of polysilicon by LPCVD process giving details of the deposition process and typical deposition parameters used. 5

For boron, $D = 2.25 \times 10^{-3}$ $\mu m^2/h$ at 950 °C and $D = 1.6 \times 10^{-1}$ $\mu m^2/h$ at 1150 °C
Solid solubility at 950 °C = $5.0 \times 10^{20}$ $cm^{-3}$