

# VLSI TECHNOLOGY

## SEM V, 2011-12

### B.TECH

## UTTARAKHAND TECH. UNIVERSITY (UTU)

Time: 3 hours

Total marks :100

Attempt any four parts of the following:

1. Discuss different steps in preparing wafers from raw silicon.
2. A silicon ingot with  $0.5 \times 10^{16}$  boron atoms/cm<sup>3</sup> is to be grown by CZ method. What should be the concentration of Boron in the melt to obtain the required doping concentration? The segregation coefficient of boron is 0.8.
3. Explain the application of SiO<sub>2</sub> layer in IC fabrication.
4. Show that to grow an oxide layer of thickness  $x$ , a thickness of  $0.44 x$  of silicon is consumed.
5. Explain briefly features size, chips, wafers, hybrid and monolithic circuits.
6. State Moore's law and explain the deviation from the predicated path.

Attempt any four parts:

1. If the measured phosphorous profile is represented by a Gaussian function with a diffusivity  $D = 2.3 \times 10^{-13}$  cm<sup>2</sup>/s, and the measured junction depth is  $1 \times 10^{18}$  atoms/cm<sup>2</sup> and the measured junction depth is  $1 \mu$  at a substrate concentration of  $1 \times 10^{15}$  atoms/cm<sup>3</sup>. Calculate the diffusion time.
2. Describe a typical ion implanter. What are the advantages of ion implantation?
3. Explain vapor phase epitaxy and also tell what are the sources of silicon in vapour phase epitaxy.
4. Compare ion implantation process with diffusion.
5. What do you mean by annealing and why it is required in IC fabrication process.
6. Explain solid source diffusion of Boron.

Attempt any four parts:

1. List the defects in pattern transfer.
2. List all process steps of pattern transfer with diagram.
3. What are PR materials? Describe all types of PR. What are the properties of good PR?
4. Explain proximity printing and projection printing and compares these two.
5. Explain all properties of etchant.
6. Explain ion beam lithography process.

Attempt any Two parts:

1. Give the various fabrication steps of npn transistor with diagram and brief explanation.
2. Explain the metallization and also describe the problems associated with the process. Explain the sputtering method of metallization.
3. Give the various fabrication steps of CMOS transistor using n well technique with diagram and brief explanation.

Attempt two parts:

1. Write a short note on Package types and packaging design VLSI technology. What is meant by DIP?
2. Write a detailed note on different yield loss mechanisms in VLSI.
3. Explain why modeling of yield loss mechanisms is required. Explain general model of yield loss mechanism and also explain accelerated testing in brief.