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Paper Id: 131633

Sub Code: NEC 603

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B TECH
(SEM-VI) THEORY EXAMINATION 2017-18
INTEGRATED CIRCUIT TECHNOLOGY

Time: 3 Hours**Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief. 2 x 10 = 20**

- a. What are point defects?
- b. List the steps used in the preparation of Si – wafers.
- c. What do you mean by SOI?
- d. Define the process of oxidation .List two important properties of SiO₂.
- e. Explain isotropic & anisotropic etching processes.
- f. What is metallization?
- g. What is the difference between pseudo homo epitaxy and hetero epitaxy?
- h. What is step coverage problem in IC fabrication?
- i. What are the advantages of ion implantation technique?
- j. Explain basic differences between Bipolar and MOS Integrated Circuits

SECTION B**2. Attempt any three of the following: 10 x 3 = 30**

- a. Describe CZ process in detail with neat diagram. What is the Pull Rate in CZ technique? How the Pull Rate is controlled during the CZ crystal growth process?
- b. Why Oxidation is necessary in IC fabrication? Calculate the oxide thickness. Show that $\frac{x}{A/2} = \left[1 + \frac{t+\tau}{A^2/4B}\right]^{1/2} - 1$, reduces to $x = \frac{B}{A}(t + \tau)$ for short time and to $x = \sqrt{B(t + \tau)}$ for long time, where x = oxide thickness.
- c. Derive the diffusion equation. How the depth of diffusion is controlled during diffusion process? Give the solution of Fick's Law?
- d. Explain the metallization and describe the problems associated with this process. Explain dc sputtering method of metallization.
- e. How a NPN transistor can be fabricated? Explain all the steps of fabrication. Also compare it with NMOS fabrication.



**SECTION C**

- 3. Attempt any *one* part of the following: 10 x 1 = 10**
- Explain the basic working principle of ion implantation process with all necessary equations. Compare between the diffusion and ion implantation process.
 - A silicon ingot with 0.5×10^{16} boron atoms/cm³ 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 the boron is 0.8.
- 4. Attempt any *one* part of the following: 10 x 1 = 10**
- What is Epitaxy? Discuss Molecular Beam Epitaxy technique in brief. What are the advantages of MBE over VPE?
 - What do you mean by film deposition? Explain different types of films deposited in IC fabrication.
- 5. Attempt any *one* part of the following: 10 x 1 = 10**
- Explain the following terms: (i) Self Aligned Bipolar structures (ii) Integrated Injection Logic.
 - Explain proximity printing and projection printing & compare these two.
- 6. Attempt any *one* part of the following: 10 x 1 = 10**
- (i) Explain the kinetics of wet etching. How gold is etched?
(ii) What are PR materials? What are the properties of different PR?
 - If the measured phosphorus profile is represented by a Gaussian function with a diffusivity $D = 2.3 \times 10^{-13}$ atoms/cm², the measured surface dose is 10^{18} atoms/cm² and the measured junction depth is 1 μ m at a surface concentration of 10^{15} atoms/cm³. Calculate the diffusion time.
- 7. Attempt any *one* part of the following: 10 x 1 = 10**
- Write short note on package types and packaging design VLSI Technology. What is meant by DIP? Explain in brief.
 - Write short Notes on (i) Annealing (ii) Chemical Vapor deposition(CVD)