

7E4047

Roll No. _____

[Total No. of Pages : 3]

7E4047

B. Tech. VII Semester (Main/Back) Examination, Nov-Dec - 2011
Electronics & Communication Engineering
7EC4 I.C. Technology

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 24

Instructions to Candidates:

Attempt any **five questions** selecting **one question** from **each unit**. All questions carry **equal marks**. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Unit - I

1. a) Discuss various steps for wafer preparation from the Si ingot obtained after Cz or Fz method. (6)
- b) Explain the different kinds of crystal defects. (5)
- c) In a Cz growth, if the density of solid silicon is $1.4 \times 10^{-3} \text{ gm/cm}^3$, thermal conductivity of solid is $7.6 \times 10^{-4} \text{ mho}$ and thermal gradient at the interface is 0.4, then find out the maximum pull rate. Assume the latent heat of fusion is 1.5J. (5)

OR

1. a) What is Czochralski growth? Differentiate between pull rate and growth rate. Can the pull rate become negative? If yes, explain why? (6)
- b) What do you understand by MGS and EGS? How is EGS obtained from MGS? (5)
- c) Find the concentration of boron in crystal at a fraction solidified of 0.5, if C_s at $X=0.04$ is 2×10^{18} and segregation Coefficient is 0.8. (5)

7E4047

Roll No. _____

[Total No. of Pages : 3]

7E4047**B. Tech. VII Semester (Main/Back) Examination, Nov-Dec - 2011****Electronics & Communication Engineering****7EC4 I.C. Technology****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 24****Instructions to Candidates:**

Attempt any **five questions** selecting **one question** from **each unit**. All questions carry **equal marks**. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Unit - I

1. a) Discuss various steps for wafer preparation from the Si ingot obtained after Cz or Fz method. (6)
- b) Explain the different kinds of crystal defects. (5)
- c) In a Cz growth, if the density of solid silicon is $1.4 \times 10^{-3} \text{ gm/cm}^3$, thermal conductivity of solid is $7.6 \times 10^{-4} \text{ mho}$ and thermal gradient at the interface is 0.4, then find out the maximum pull rate. Assume the latent heat of fusion is 1.5J. (5)

OR

1. a) What is Czochralski growth? Differentiate between pull rate and growth rate. Can the pull rate become negative? If yes, explain why? (6)
- b) What do you understand by MGS and EGS? How is EGS obtained from MGS? (5)
- c) Find the concentration of boron in crystal at a fraction solidified of 0.5, if C_s at $X=0.04$ is 2×10^{18} and segregation Coefficient is 0.8. (5)

Unit - II

2. a) Develop Fick's laws of diffusion. Write their solutions for constant surface concentration and constant total dopant for constant diffusivities. Clearly state the boundary conditions for both cases. (8)
- b) Explain the Deal Grove model of oxidation and discuss the effects of presence of water, sodium and Halogens on oxidation. (8)

OR

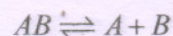
2. a) State the differences between diffusion and ion-implantation. (6)
- b) Discuss the various diffusion mechanisms by which the impurities diffuse in silicon crystal. (6)
- c) What is annealing? Explain it. (4)

Unit - III

3. a) Give an account of various types of CVD reactors. (8)
- b) Give the advantages of molecular beam epitaxy over CVD. (5)
- c) What is autodoping and how can this be minimized? (3)

OR

3. a) Give an account of various defects introduced during epitaxial growth. (5)
- b) Discuss various CVD techniques for deposition of SiO_2 . Also state the parameters on which SiO_2 deposition depends. (6)
- c) Assume that the gas AB is introduced into a CVD reactor and that the only chemical reaction that occurs in the chamber is :



If the process is run at 1 atm (760 torr) and a temperature of 1000 K and reaches chemical equilibrium, calculate the partial pressure of each species.

The equilibrium constant for this reaction is given by $K(T) = 1.8 \times 10^9 e^{-2\text{eV}/KT}$ (5)

Unit - IV

4. a) Explain positive and negative photoresists. Why positive photoresists give higher resolution? (5)
- b) Differentiate between dry and wet etching. (5)

- c) An etch rate of $300 \text{ \AA}/\text{min}$ has been reported by a plasma etch system for etching a single wafer. It has been observed that on adding another wafer to the reactor, etch rate falls to $240 \text{ \AA}/\text{min}$. Now find out the new respective etch rates for three and four wafers. (6)

OR

4. a) Give an account of reactive ion etching clearly stating the problems associated with it. (10)
- b) Give an account of contact and proximity printers. (6)

Unit - V

5. a) Give an account of applications and desired properties of metallization. (8)
- b) What is Bipolar IC Technology? Explain in detail with proper process sequence. (8)

OR

5. Write short notes on **any two** :

- a) LOCOS method (8)
- b) SOI Techniques (8)
- c) Problems associated with metallization. (8)

OR