7E4047

Roll No. ____________ [Total No. of Pages : 3

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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 1.4×10^{-3} gm/cm^3, thermal conductivity of solid is 7.6×10^{-4} 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)**

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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 :

$$AB \rightleftharpoons A + B$$

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 $K(T) = 1.8\times10^{9}\, e^{-2ev/KT}$ **(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 $300\,\overset{o}{A}/\text{min}$ has been reported by a plasma etch system for etching a single wafer. It has been observed that on adding an another wafer to the reactor. etch rate falls to $240\,\overset{o}{A}/\text{min}$. 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)**