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8E8021

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B.Tech. VIII Semester (Main) Examination, April/May 2016

Electronics And Communication Engg.

8EC1A - IC 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) Explain the various defects in crystal with appropriate equation and diagram (6)
- b) How EGS is obtained from MGS. Also draw the block diagram for the production of EGS, and also write its chemical reaction. (6)
- c) Find out the concentration of oxygen in crystal at a fraction solidified of 0.4 the oxygen concentration at the top of crystal i.e at $X=0.05$, $C_s=1.3 \times 10^{18}$ atom/cm³ segregation coefficient for oxygen to be 0.25 (4)

OR

1. a) Draw the block diagram of float zone growth technique and also show the four point probe technique for resistance measurement (6)
- b) What are the various steps for wafer preparation. Explain each term in detail (6)
- c) A boron doped crystal is measured at it's seed end with a four-point probe of spacing 1mm, resistance is 10Ω . What is the seed and doping and the expected reading at 0.95 fraction solidified (4)

Unit - II

2. a) Derive Fick's law with its proper analytical solution. Also write the boundary conditions for both cases. (8)
- b) An n⁺ diffusion is performed into a p-type silicon having a uniform dopant concentration of 5×10^{23} atom/m³. If the dopant concentration in the gas above the wafer surface is maintained constant 5×10^{26} atom/m³ and process time is 30 min. Calculate the depth of n-type diffusion. The diffusion coefficient is 5×10^{-17} m²/sec and $\text{erfc}(2.3) = 10^{-3}$ (8)

OR

2. a) Explain Deal-Groove model of oxidation with proper equation (10)
- b) Discuss the various diffusion mechanisms by which the impurities in silicon crystal (6)

Unit - III

3. a) What are various types of CVD reactors (4)
- b) What is autodoping and how can this be minimized (5)
- c) Explain chemical equilibrium and the law of Mass action (7)

OR

3. a) Assume that the gas AB is introduced into a CVD reactor and that the only chemical reaction that occurs in the chamber is $A+B \rightleftharpoons A+B$. If the process is run at 1 atm (760 torr) and a temp of 1000K and reaches chemical equilibrium. Calculate the partial pressure of each species? The equilibrium constant for this reaction is given by $K(T) = 1.8 \times 10^9 e^{-2\text{eV}/KT}$ (7)
- b) Discuss various CVD techniques for deposition of SiO₂. Also state the parameters on which SiO₂ deposition depends (9)

Unit - IV

4. a) Draw the flow chart for mask generation process. Explain each term with proper explanation (5)
- b) Distinguish between wet etching and dry etching. What is the role of a buffer in the context of wet etching (7)
- c) Explain the working of positive photo resist and negative photo resist. Why positive photo resist gives high resolution (4)

OR

4. a) Give an account of reactive ion etching clearly stating the problems associated with it (10)
- b) Explain the projection printing with suitable diagram (6)

Unit - V

5. a) Write the fabrication process sequence for
- i) n-well CMOS process
 - ii) Twin tub CMOS process
- (10)
- b) What do you understand by bipolar IC technology? Give an comparison between bipolar and CMOS technology (6)

OR

5. a) Write short note on any two
- i) LOCOS method
 - ii) SOI techniques
 - iii) Problem associated with metallization
- (5×2=10)
- b) Explain the working difference between CMOS and bipolar IC technology (6)