

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 131854

Roll No.

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B.Tech.

(SEM. VIII) THEORY EXAMINATION 2013-14

INTEGRATED CIRCUIT TECHNOLOGY

Time : 3 Hours

Total Marks : 100

Note :- (1) Attempt all questions.

(2) All questions carry equal marks.

1. Attempt any **four** parts of the following : **(4×5=20)**
 - (a) What are the factors that have led to the evolution and enhancement of VLSI Integrated Circuits ?
 - (b) Describe the various factors which must be taken into account in order to grow single crystals which are relatively free from defects in brief.
 - (c) What is epitaxial layer ? What are the various parameters to assess the quality of epitaxial layer for Si ? Describe the measurement method for any one of them.
 - (d) Discuss the operations performed during wafer preparation. What are the precautions that must be taken.
 - (e) Give classification of Integrated Circuits. Explain bipolar and MOS I.C. Technology.
 - (f) What is autodoping ? What are the effects of autodoping on impurity profile of epi-layer ?

2. Attempt any **two** parts of the following : (2×10=20)

- (a) (i) Why is oxidation done ? Explain the kinetics of oxide growth.
- (ii) All modern Si MOSFETS are fabricated on (100) oriented Si substrate. Explain why ?
- (b) (i) Describe the photoresist process. Explain the negative photoresists and advantage of it over positive photoresist.
- (ii) What is wet chemical etching ? Name the common etchant used in integrated circuit fabrication with their composition for Si, SiO₂ and Si₃N₄ etching (one for each case).
- (c) Describe briefly the advantages and disadvantages of Atmospheric Pressure Chemical Vapour Deposition (APCVD). Also describe the system.

3. Attempt any **two** parts of the following : (2×10=20)

- (a) (i) State and explain Fick's first law of diffusion. Derive Fick's second law from the first.
- (ii) How will you fabricate a p-n junction by the diffusion process. Discuss the properties of the junction formed.
- (b) (i) Why Boron and Phosphorus are preferred for p and n diffusions of respectively for silicon compared to other dopants.
- (ii) What are the various types of diffusion systems ? Describe with suitable sketch a gaseous technique for Boron diffusion.
- (c) What is Ion-implantation ? Why ion-implantation is preferred over diffusion for impurity doping ? Explain briefly ion-implantation technique.

4. Attempt any **two** parts of the following : (2×10=20)

- (a) Define thin films. Describe a physical vapour deposition technique for film deposition what should be the required characteristics of the deposited film and how can it be achieved ? Explain.
- (b) What are the applications of metallization ? What are the various choices for it ? Why silicides are used ? Discuss the advantages associated with silicide technology. List the metals used in silicidation.
- (c) Write a short note on packaging of VLSI devices.

5. Attempt any **two** parts of the following : (2×10=20)

- (a) Explain different methods to obtain isolation between components in monolithic integrated circuits. How will you eliminate the parasitic capacitance in monolithic integrated circuits due to p-n junction isolation ?
- (b) With the help of IC process flow diagram describe briefly, the basic considerations for IC processing steps for an n-channel, polysilicon MOS circuit.
- (c) Explain the term 'self aligned gate'. What is the requirement of self aligned gate ? How is it achieved ?