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

PAPER ID : 2889 **Roll No.** | | | | | | | | | | |

B.Tech.

(SEM. VIII) EVEN THEORY EXAMINATION 2012-13

INTEGRATED CIRCUIT TECHNOLOGY

Time : 3 Hours *Total Marks : 100*

Note :– (1) **All** questions are compulsory, however internal choices are given.

(2) All questions carry equal marks.

1. Attempt any **four** parts of the following : **(5×4=20)**

(a) Briefly explain the various advantages of Integrated Circuits (ICs) over the discrete components.

(b) What is Integrated Circuit ? How the general classification of integrated circuits is done ? What are different scales of integration of ICs ?

(c) A silicon ingot, which should contain 10^6 boron atoms/cm^3, is to be grown by Czochralski technique. What concentration of boron atom should be in the melt to give the required concentration in the ingot ? If the initial load of the Silicon in the crucible is 60 kg, how many grams of boron (atomic weight 10.8) should be added ? The density of molten silicon is 2.53 g/cm^3. Take the value of segregation coefficient for boron as 0.8

(d) Describe various steps for production of Electronic Grade Silicon (EGS) from the Metallurgical Grade Silicon (MGS) with the aid of suitable diagram.

(e) At 300 K, the molecular diameter of oxygen is 3.64 Å, and the number of molecules per unit area N_s is 7.54×10^{14} cm^{-2}. Find the time required to form a monolayer of oxygen at pressure of 1, 10^{-4} and 10^{-8} Pa in Molecular Beam Exitaxy (MBE) process.

(f) What is Epitaxy process ? How it is different from crystal growth ? List out various uses of Epitaxy.

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

(a) What is thermal oxidation process ? How it takes place chemically ? How the growth rate of oxide layer varies with oxidation time ? List out various utilities of thermal oxidation in the IC fabrication technology.

(b) What is photolithography ? Explain various photolithography steps used in IC fabrication process with brief explanation and diagram.

(c) How Silicon Nitride deposition is done ? Explain with suitable sketches, the LOCOS process used in fabrication of some high-density ICs.

3. Attempt any **four** parts of the following : **(5×4=20)**

(a) What is diffusion ? Explain substitutional and interstitial diffusion. On which factors the diffusion rate depends.

(b) Explain the Fick's laws governing the diffusion process.

(c) Describe limited source diffusion with the help of suitable diagram.

(d) Explain how the sheet resistance of a diffused layer is measured using four probe method. Provide the necessary formula for the same.

(e) What is ion implantation ? Explain how it is an alternative to deposition diffusion.

(f) With the aid of suitable sketch, explain the construction of ion implantation system.

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

(a) What is metallization ? What are the desired properties of the metallization for ICs ? Why Aluminium is the most commonly used material for metallization ? List out with brief description, the various steps used in the metallization.

(b) What is sputtering process ? How it is useful in metallization process ?

(c) With the aid of suitable block diagram explain the various steps of Bipolar IC process.

5. Write the short notes on any **two** of the following : **(10×2=20)**

(a) NMOS vs PMOS IC technology

(b) Monolithic and Hybrid ICs

(c) Packaging of ICs