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No. of Printed Pages—3

EC-605

B. TECH.

SIXTH SEMESTER EXAMINATION, 2003-2004

VLSI-TECHNOLOGY

Time : 2 Hours

Total Marks : 50

Note : Attempt ALL the questions.

1. Attempt any *FOUR* of the following :— (3×4)

- (a) In bipolar IC, the transistors are suitably connected to act as diode. How many ways are there to connect the transistor to form a monolithic diode ? Which diode do you rate as optical ? Justify your answer.
- (b) Describe a lateral p-n-p transistor. Why is its current gain low ?
- (c) Draw the equivalent circuit of a base diffused resistor, showing all parasitic elements. What can externally be done to minimize the effect of parasitic elements ?
- (d) What are the techniques to form oxide layer ? What are the applications of silicon dioxide layer ? Describe in brief.
- (e) Define Scale of Integration. Differentiate between Scale of Integration and Package Density. What are the advantages of integrated circuit over discrete components ? Explain.
- (f) What are various operations performed during wafer preparation ? Explain one machining and one chemical operation required to perform during wafer preparation.

2. Attempt any *FOUR* parts of the following :— (3×4)

- (a) What is Fick's Law of diffusion ? Boron is diffused into an *n*-type single crystal substrate with doping concentration of 10^{15} atoms/cm³. Assuming diffusion function as Gaussian, if diffusion time is 1 hour, surface concentration is 1×10^{18} cm⁻³ and depth of junction is 2μ m, determine diffusivity.
- (b) What do you mean by Ion Implantation ? If an analyzing magnet bends the ion beam through 45° and $L = r = 50$ cm, find the displacement D that would be seen if B_{10} is sent through the system when it is tuned for B_{11} . If the extraction potential is 2 kV, find field required.
- (c) Explain Proximity Printing and Projection Printing and compare these two.
- (d) Explain negative photoresists and etchant with examples.
- (e) Write short note on Photolithography.
- (f) Explain epitaxial growth. What are different techniques of epitaxial layer growth ? Describe any one.

3. Attempt any *TWO* parts of the following :— (6×2)

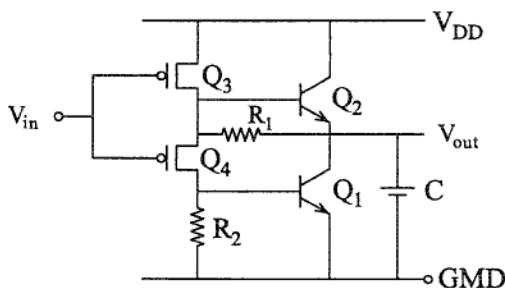
- (a) What do you mean by Sputtering ? Explain Sputtering Yield. Draw the schematic diagram of single parallel-plate sputtering system and its working.
- (b) Draw the circuit diagram, of ECL OR/NOR gate and explain its working with the help of transfer characteristic curve. What are the advantages, disadvantages and area of application of ECL logic circuit ?

(c) What do you mean by multiemitter transistor ? Draw layout and structure of multiemitter transistor ? What are its advantages and uses ? Explain.

4. Attempt any TWO of the following :— (6.5×2)

(a) Compare CMOS and Bipolar technology. What are different steps involved in the fabrication of a n -MOS device ? Explain each step with suitable diagrams.

(b) A circuit is shown in the figure —



Name the circuit. Explain its features and role of resistances R_1 and R_2 .

(c) What do you mean by Latch Up ? Explain, with the help of mathematical expressions, how latch up can be avoided in CMOS technology.