

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

PAPER ID : 3093

Roll No.

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B.Tech.

(SEM VI) EVEN SEMESTER THEORY EXAMINATION,
2009-2010

VLSI TECHNOLOGY AND DESIGN

Time : 3 Hours

Total Marks : 100

Note : *Attempt all questions.*

1. Attempt any four parts of the following : (4x5=20)

- (a) Define the term IC. List its types. How does analog ICs' differ from digital ICs' ?
- (b) In Bipolar IC the transistor are suitable connected to act as diode. How many ways are there to connect transistor to form a monolithic diode ?
- (c) Show that thickness of oxide during growth is directly proportional to time for small oxidation time.
- (d) Explain why extremely rapid growth is observed during wet oxidation compared to dry oxidation ?

- (e) A thin film capacitor has a capacitance of 0.4 pF/mil^2 . The relative dielectric constant of SiO_2 is 3.5. What is the thickness of SiO_2 layer in angstroms ?
- (f) Explain the various techniques to form oxide layer and describe the applications of oxide layer.
2. Attempt **any two** parts of the following : (2x10=20)
- (a) Why is diffusion needed to form a bipolar transistor ? Explain with each diffusion step. What is the equilibrium concentration of Schottky defects in Si at 300 K ?
- (b) Write short notes on :
- (i) Annealing
- (ii) Epitaxy
- (c) What are photo resist materials ? Describe types of photo resists. What are the requirements of oxide used for a mask in photolithography ?
3. Attempt **any four** parts of the following : (4x5=20)
- (a) What is the advantage of polysilicon gate over metal gate ? How is it fabricated ?
- (b) Describe the operation of a basic MOS inverter. Derive the expression for a pull up to pull down ratio for an N MOS inverter.
- (c) Define the threshold voltage and derive the expression for V_{th} in a MOS transistor.
- (d) Draw a CMOS inverter and explain its transfer characteristics.
- (e) Realize the expression $Y = \overline{A(D + E) + BC}$ using nMOS transistor.
- (f) Draw the circuit diagram of one stage of a dynamic CMOS register.

- (a) Draw a stick diagram for a two input multiplexed latch, using the two transmission gate side by side.
- (b) Discuss the architecture of FPGA. How FPGA programmed ?
- (c) (i) Sketch the circuit diagram of a ratio less MOS inverter and explain its operation.
(ii) Discuss the operation of a 4 cell MOS RAM.

5. Attempt any two parts of the following : (2x10=20)

- (a) Describe the lambda design rules and layout methodology for CMOS circuit design.
- (b) Discuss programmable logic array (PLA) with example of NMOS PLA.
- (c) Write a short note on VLSI testing.

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