

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SIXTH SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: EC304

Course Name: VLSI

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks

Marks

- 1 a) With a neat sketch, explain the process of ion implantation for IC fabrication. (8)
- b) Draw schematic and explain any two CVD processes. (7)
- 2 a) With the help of neat diagram explain crystal growth in Czochralski process. (7)
- b) Define photolithography and discuss various steps involved in photolithographic process. (8)
- 3 a) A Si sample is covered with $0.25\mu\text{m}$ thick SiO_2 layer. Find the time required to grow an additional $0.2\mu\text{m}$ thick SiO_2 at 1200°C by dry oxidation. For dry oxidation at 1200°C $B = 0.045 \mu\text{m}$, $B/A = 1.120 \mu\text{m/hr}$, $\tau = 0.027$ (5)
- b) Solve Fick's law for pre deposition diffusion. (3)
- c) List various methods of resistor fabrication. (7)

PART B

Answer any two full questions, each carries 15 marks

- 4 a) The VTC of an inverter is given in Figure 1. (4)

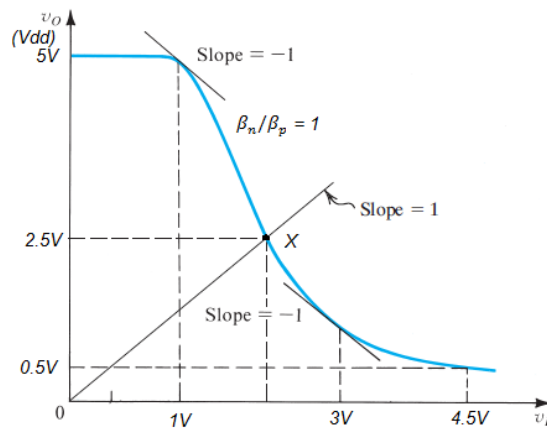


Figure 1.

Define the terms Noise Margin Low and Noise Margin High. Calculate their numerical values.

- b) Calculate drain current for the region marked X in Figure 1. Given $V_{tn} = |V_{tp}| = 0.5\text{V}$ and $\beta_n = 1\text{mA/V}^2$. (3)
- c) Draw the circuit of NMOS pass transistor logic. Discuss its output characteristics and comment on the drawbacks. (8)
- 5 a) For a two input CMOS NOR gate, draw (10)
 - i. Circuit diagram
 - ii. Stick diagram

- iii. Layout
- b) Implement the logic function $(AB + C(A+D))'$ using CMOS logic. (5)
- 6 a) Draw the switching characteristics of CMOS inverter and discuss the terms associated with it. (6)
- b) Realize an XOR gate using (9)
 - i. CMOS logic
 - ii. NMOS pass transistor logic
 - iii. Transmission gate logic

PART C

Answer any two full questions, each carries 20 marks

- 7 a) Draw the circuit diagram of a 6T CMOS SRAM cell. Briefly explain the read and write operations by drawing simplified models. (10)
- b) Implement a full adder using complementary static CMOS. Explain the merits and demerits associated with the circuit. (10)
- 8 a) Draw and explain the internal architecture of an FPGA. List four applications of FPGA. (10)
- b) With block diagrams, illustrate the behaviour of linear carry select adder and square root carry select adder. (10)
- 9 a) How does a sensing amplifier contribute to the operation of an SRAM? With a circuit diagram, explain how differential sensing is applied to an SRAM memory column. (10)
- b) Show the conversion of a ripple carry adder into a carry bypass adder. Draw the block diagram of a 16 bit carry bypass adder and show the worst-case delay path. (10)
