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MANIPAL INSTITUTE OF TECHNOLOGY Manipal University FIFTH SEMESTER B.TECH (E & C) DEGREE END SEMESTER EXAMINATION - NOV/ DEC 2016 SUBJECT: VLSI DESIGN (ECE - 3104)

TIME: 3 HOURS

MAX. MARKS: 50

Instructions to candidatesAnswer ALL questions.

- Missing data may be suitably assumed.
- 1A. Explain the steps involved in the fabrication process of NMOS enhancement type MOSFET.
- 1B. Derive the pull-up to pull-down ratio (Z_{PU}/ Z_{PD}) for an NMOS inverter driven by another NMOS inverter through transmission gate?
- 1C. Bring out differences between Depletion type and Enhancement type MOSFETs.

(5+3+2)

2A. [i] Explain the need to consider the interconnect parasitics. List the different classes of interconnect parasitics.

[ii] What is a capacitive cross talk? List the guidelines to be followed to deal with capacitive cross talk.

- 2B. Implement the functions, F1 = ab + ac, F2 = ab + c using Pseudo NMOS PLA.
- 2C. Draw the stick notation of sense amplifier used in SRAM design.

(5+3+2)

- 3A. Derive the expression for drain current in the case of NMOS enhancement type transistor operated in saturation region.
- 3B. Implement 2 input NAND gate using BICMOS logic.
- 3C. Compare the static power dissipation in a Pseudo NMOS inverter and that of a depletion pull-up NMOS inverter.

(5+3+2)

- 4A. Implement the bus arbitration logic for N line bus using structured approach. Also give the stick diagram for standard cell.
- 4B. Give the circuit schematic of following :

[i] Clocked CMOS 2-input NOR gate [ii] cascaded domino CMOS implementation of function $Z = (a+b) \cdot c$ without using complemented variables [iii] inverting type super buffer

4C. Find the dynamic capacitive power dissipated in a CMOS inverter fed with a 10 MHz clock for capacitive load of 100 pF. Given that $V_{DD} = 5$ V.

(5+3+2)

- 5A. Give the circuit, stick notation and Layout for CMOS two input NAND gate.
- 5B. Give the structured implementation and stick notation of one bit full adder element using NMOS switch logic.
- ⁵C. Give the CMOS implementation and stick notation for the function Z = (A B + C)'.

(5+3+2)