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Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90460

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Sixth/Seventh Semester

Electronics and Communication Engineering

EC 8095 – VLSI DESIGN

(Common to : Electrical and Electronics Engineering/Electronics and Instrumentation Engineering/Electronics and Telecommunication Engineering/Instrumentation and Control Engineering/Robotics and Automation)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

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1. Draw a 2-input CMOS NOR gate.
2. By what factor R_{DS} should be scaled, if constant electric field scaling is employed?
3. Using transmission gate draw a 4:1 MUX.
4. What is charge sharing in dynamic CMOS logic?
5. State the use of Schmitt Trigger.
6. Draw a MUX based negative level sensitive D-latch.
7. Compare SRAM and DRAM.
8. Draw a 1-transistor DRAM cell.
9. Define controllability and observability.
10. Mention the advantages of BIST.

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PART B — (5 × 13 = 65 marks)

11. (a) With neat diagram, enumerate in detail the DC characteristics of CMOS inverter. (13)

Or

(b) (i) Analyze the switching characteristics of a CMOS inverter. Derive rise time, fall time and propagation delay. (6)

(ii) If two CMOS inverters are cascaded with an aspect ratio of 1:1 then determine the inverter-pair delay. (7)

12. (a) (i) Design a half adder using static CMOS logic. (6)

(ii) Design a 4:1 MUX using 2:1 MUX. Realize it using transmission gate. (7)

Or

(b) Realize a 2-input NOR gate using static CMOS logic, Domino logic and Complementary pass transistor logic. Analyze the hardware complexity in terms of transistor count. (13)

13. (a) (i) Enumerate in detail on the design of pulse registers. (6)

(ii) Give in detail, the design and working of astable sequential circuits. (7)

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Or

(b) (i) Design a master-slave positive edge triggered D-flipflop using transmission gate. (6)

(ii) Discuss on sense amplifier based registers. (7)

14. (a) Describe the hardware architecture of a 4-bit signed array multiplier. (13)

Or

(b) (i) Elaborate in detail the design of a 4-bit barrel shifter. (6)

(ii) Describe the working of 6-transistor SRAM cell. (7)

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15. (a) Explain in detail the basic architecture of FPGA with a neat diagram. (13)

Or

(b) Enumerate in detail the working of

(i) Adhoc Test (5)

(ii) Scan based Test (8)

PART C — (1 × 15 = 15 marks)

16. (a) Apply Radix-2 booth encoding to perform multiplication between two 8-bit numbers (-5) and 4. (15)

Or

(b) (i) Design a 4-bit carry look ahead adder using dynamic CMOS logic by deriving the necessary expressions. (6)

(ii) Design a 3-bit even parity generator using NAND gates only. Design the circuit using static CMOS logic. (9)

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