BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Tech.(CSE)-AIML-2021/B.Tech.(CSE)-DS-2021
Course Name – VLSI Design
Course Code - OEC-CSM801B/OEC-CSD801B
(Semester VIII)

Full Marks : 60   **Time : 2:30 Hours**
[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)   1 x 15=15

1.   *Choose the correct alternative from the following :*

(i)   Define VLSI.

   a) A type of software program   b) A methodology for designing circuits
   c) A type of processor architecture   d) A type of network protocol

(ii)   Identify the meaning of "semiconductor" in the context of VLSI.

   a) A material that conducts electricity well   b) A type of insulator
   c) A material that resists the flow of electricity d) A type of conductor

(iii)   Define a transistor.

   a) A semiconductor device used to amplify or   b) A type of software program
      switch electronic signals
   c) A type of processor architecture   d) A type of network protocol

(iv)   List the primary steps involved in transforming a circuit design into a physical layout.

   a) Circuit optimization, circuit verification,   b) Circuit verification, physical design, circuit
      physical design   optimization
   c) Physical design, circuit optimization, circuit d) Not given
      verification

(v)   Define the term "IC" in the context of VLSI.

   a) An integrated circuit   b) An insulator circuit
   c) An inductive circuit   d) An invert circuit

(vi)   List some common applications of VLSI technology.

   a) Smartphones, computers, TVs   b) Cars, airplanes, boats
   c) Refrigerators, washing machines, vacuum   d) Not provided
      cleaners

(vii)   Identify the type of signals that VLSI circuits are designed to process.

   a) Analog signals and binary signals   b) Analog signals only
   c) Binary signals only   d) Sound signals and image signals

(viii)   Classify the types of semiconductor materials used in Silicon technology.

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a) Intrinsic and Extrinsic
b) Conductors and Insulators
c) N-type and P-type
d) Metals and Alloys

(ix) Convert raw silicon into wafers using which process?

a) Czochralski Process
b) Oxidation
c) Ion Implantation
d) Photolithography

(x) Paraphrase the function of a clocked SR latch.

a) Prevents invalid states
b) Acts as a buffer
c) Enables feedback
d) Doesn't allow invalid states

(xi) Restate the difference between static and dynamic CMOS logic.

a) Static logic is faster
b) Dynamic logic consumes less power
c) Static logic is complex
d) Dynamic logic is unstable

(xii) Outline the advantages of FPGA over ASIC.

a) Reprogrammability
b) Lower Cost
c) Faster Speed
d) Fixed Functionality

(xiii) Name the essential components of FPGA architecture.

a) CLBs
b) Microcontroller
c) ALU
d) DRAM

(xiv) Match the following: FPGA - ?

a) Field Programmable Gate Array
b) Fixed Process Gate Array
c) Flexible Programmable Grid Array
d) Fabricated Process Grid Array

(xv) Quote an application of Standard Cell Design.

a) Microprocessors
b) Antennas
c) Sensors
d) Batteries

Group-B
(Short Answer Type Questions)

3 x 5=15

2. Describe the key stages involved in Silicon Semiconductor Technology. (3)
3. List the differences between Full Custom and Semi-Custom VLSI Design. (3)
4. List the advantages and disadvantages of CMOS technology. (3)
5. Discuss the advantages of VLSI chips over earlier technologies. (3)
6. Differentiate between analog and digital VLSI design. (3)

OR

illustrate VLSI chips influence in modern technology (3)

Group-C
(Long Answer Type Questions)

5 x 6=30

7. Discuss the different CMOS fabrication processes, including the n-well, p-well, twin-tub, (5) and silicon-on-insulator (SOI) processes and explain the advantages and disadvantages of each approach

8. Prioritize layout design rules in CMOS circuit design and explain their importance in (5) ensuring functionality and reliability.

9. Explain the working of a CMOS Inverter with a neat diagram. Discuss its voltage transfer (5) characteristics and noise margins in detail. Additionally, illustrate how the switching threshold is determined and how different parameters affect its performance.

10. Choose the best CMOS flip-flop design for edge-triggered applications and justify your (5) selection.

11. Diagram the FPGA internal architecture and explain how its components work together. (5)

12. Analyze the impact of Moore's Law on the evolution of VLSI technology and the limitations (5) and future prospects of this law in modern semiconductor advancements.

OR

Categorize the different types of VLSI chips based on their functionality and applications with examples of each type and discuss their significance. (5)

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