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Department of Computer Science and Engineering
B. Sc. in Computer Science and Engineering
Semester Final Examination 2017 (Jul-Dec) .
Level 4 Semester II, Course Code: CSE 457, Credit: 3.0
Course Title: VLSI Design

Time: 03 Hours | Total Marks: 90

[N.B. The figure in the right margin indicates the marks allocated for respective question. Split answer of any question will not be accepted.]

SECTION-A

*(Answer any **three** from the following questions.)*

1. (a) Describe VLSI IC family. Briefly explain the other IC families with an example for each. 2+3
   (b) Explain the speed/performance scenario of nMOS, CMOS, GaAs, BiCMOS, and ECL technologies. 5
   (c) Define bipolar transistor technology. Explain different types of MOSFET briefly. 2+3

2. (a) What is MOS and why it is important in VLSI? 1+2
   (b) State the guidelines to design a VLSI system. Discuss different types of symbols used in stick diagram. 2+3
   (c) What is fabrication in context of transistor technology? Briefly discuss about nMOS fabrication. 1+6

3. (a) Explain pass transistor and switch logic for VLSI design. 1+2
   (b) Compare between unipolar and bipolar transistor technology. 5
   (c) Derive the drain to source current I_{ds} versus voltage V_{ds} relationship equations for the non-saturated region as well as the saturated region. 7

4. (a) Define analog and digital IC. 3
   (b) Deduce the pull-down ratio Zp.u./Zp.d. for an inverter driven by another nMOS inverter. 5
   (c) Shortly describe the operational procedure of a multiplexer and design it through stick diagram using pass transistor switch logic. 7

SECTION-B

*(Answer any **three** from the following questions.)*

1. (a) Explain CMOS stick diagram design style with an example. 5

   (b) What is transmission gate? Discuss regularity factor of a VLSI design with an example. 2+3

   (c) Draw the basic circuit of BiCMOS inverter and describe its operating principle. 3+2

2. (a) Mention the necessities of transistors in VLSI design. Write short note on Lambda based design rules for stick diagram. 2+3

   (b) Discuss the operational procedure of a typical parity generator and draw its stick diagram. 2+3

   (c) Define a full adder. Draw its stick diagram using multiplexer based switch logic. 2+3

3. (a) Show and briefly illustrate the stick diagram (outline) of a 4-bit adder. 5

   (b) Discuss the bus arbitration logic for *n*-line bus in favor of VLSI design. 5

   (c) Explain the subsystems of a typical ALU. 5

4. (a) How can a 4-bit adder be used for implementing the logical operations of a 4-bit ALU? Explain with proper Boolean expressions. 5

   (b) Discuss the operational procedure of a 2-input AND gate and design it through logic diagram, transistor circuit diagram and stick diagram. 5

   (c) Draw and discuss the stick diagram (outline) of a 4-bit ALU. 5