

CSE 140: COMPONENTS and DESIGN TECHNIQUES for DIGITAL SYSTEMS

Instructor: *Alex Orailoglu* (Applied Physics and Mathematics Prime 4840, alex@cs.ucsd.edu)

1. INTRODUCTION

Design Representations. Levels of Abstraction. Design Process. CAD Tools.

2. DATA TYPES & REPRESENTATIONS

Number Representations. Addition, Subtraction, Multiplication, Division. Error Correction and Detection.

3. BOOLEAN ALGEBRA

Axiomatic Definition and Basic Theorems of Boolean Algebra. Boolean Functions. Canonical Forms. Standard Forms. Gate Implementations.

4. SIMPLIFICATION of BOOLEAN FUNCTIONS

Map Method. Tabulation Method. Technology Mapping for Gate Arrays. Technology Mapping for Custom Libraries.

5. COMBINATORIAL COMPONENTS

Adders/Subtractors. Logic Unit. ALUs. Decoders. Selectors. Buses. Encoders. Comparators. Shifters. ROMs. PLAs.

6. SEQUENTIAL LOGIC

Latches. Flip-Flops. FSMs. State Minimization. State Encoding. Selection of Memory Elements.

7. STORAGE COMPONENTS

Registers. Counters. RAMs. Stacks. Queues. Datapaths. Control Unit Design.