ECE 331 Spring 2013

# Exam 1 Review

## Exam Format

- Similar to Quiz 1 & 2, combined
- 15-20 Short Answer (T/F, multiple choice, matching, fill in blank)
- 5-10 Problems covering 230 review, microcontroller architecture, ASM instructions
- Formula sheet (Boolean logic properties, powers of 2)

## Material Covered

- All lecture notes and handouts through Fri Feb 22
- Textbook: App D, App E, Ch 1, Ch 2, Ch 3 (partial), Ch 5 (partial)
- Homeworks 1, 2, 3, 4, 5, 6, 7
- Labs 1, 2, 3, 4, (no specifics from lab, only general issues related to lecture topics)

## Students bring to the exam:

- Handout 4 (ASM Instruction Set) with no additional *information* added to the handout! (highlighting is fine)
- ***No calculators***

## Mid-Term Exam Objectives (bold/colored items covered on Quiz1-2)

Objectives: At the time of the Mid-Term Exam, students should be able to:

*ECE230 Review (Appendix D & E)*

- **Perform number base conversions for Dec, Hex, Bin**
- Identify value range as *f*(# bits) and out of range overflow
- **Express numbers in S2C form, perform 2C operation, and evaluate subtraction using S2C.**
- Identify value range in S2C and determine 2C overflow
- Perform minimization of logic expressions using minimax terms, K-maps, and Boolean arithmetic
- Identify gate symbol and truth table for basic logic gates
- Describe operation of tri-state, mux, decoder
- Identity active low vs. active high logic
- Describe operation of flip flops
- Explain operation of sequential logic circuits including shift registers and counters
- **Utilize DeMorgan's relations to implement logic circuits using only NAND (or NOR) gates**

*Microcontroller Architecture (Ch. 1-2, notes)*

- Define important events/times in computer history
- Define and differentiate microprocessor, microcontroller, embedded system
- **Describe and identify components in general computer architecture**
- **Draw and label general computer architecture**
- Draw and label connections of CPU components
- Evaluate address and data bus size (# bits/signals) for a given memory size
- Identify architectural components of HC12/S12 block diagrams
- **Identify components in programmers model**
- Identify and describe main flags in CCR
- **Determine which CCR flag results from specific arithmetic operations**

*ASM Instruction Execution (Ch. 2-3)*

- Describe ASM instruction format
- Describe instruction execution cycle
- Identify the six main groupings of ASM instructions
- Describe operation/function of primary ASM instructions
- Identify instruction information from HC12 Instruction Set tables
- **Identify which CCR flags can change for each ASM instruction**
- Prepare and use mask bytes in instruction like BCLR/BSET
- **Identify and list address modes for HC12 instruction set**
- Describe and write ASM code using inherent and immediate address modes
- Describe and write ASM code using direct and extended address modes
- Describe and write ASM code using indexed-immediate address mode
- **Use ASM Instruction Chart to map results of ASM instructions**
- **List and identify assembler directives**
- Describe the steps in the assembly process
- Determine the hex machine code (op-code) for any instruction using HO_4
- **Explain simple ASM code and .LST output files**
- **Identify address, data, and program information within .LST and .S19 assembly output files**
- **Differentiate between data and program bytes stored in memory**

*ASM Programming (Ch. 2-3)*

- Use ASM simulator program to test and debug HC12 ASM code
- Write short ASM instruction blocks to achieve specific program tasks
- Describe the steps in the programming process
- Describe basic program structure and their implementations in ASM code.
- Prepare psuedocode and flowcharts to describe an algorithm
- Identify and code looping constructs
- **Describe ASM examples on page 1-4 of HO_5**
- Describe the branch concept and branching instructions
- Identify the correct branch instruction to implement a conditional program structure
- Describe and write ASM code using relative address modes
- Calculate relative offsets for branch instructions
- **Code test and branch operations using BRSET and BRCLR instructions**
- Implement (in ASM code) conditional operations using branch instructions
- **Calculate relative offset (# bytes) for branch instructions**
- **Calculate number of clock cycles and instruction time for blocks of ASM code**
- Write code for ASM loops constructs with specific delay times
- Write, simulate and debug simple ASM programs with branches

*Memory and Peripherals (Ch. 5)*

- Explain the memory map concept
- Define ‘peripheral hardware’ and identify key peripheral blocks on the case study microcontroller
- Describe I/O addressing modes for peripheral hardware (memory mapped vs. isolated)
- Explain how data memory, program memory, configuration registers and I/O devices are mapped to addresses in stored-program computer organization
- Read and write microcontroller bi-directional digital I/O ports using ASM code