

## Final Exam Review

### Exam Format

- Comprehensive: ~70% on material since mid-term exam, 30% pre-mid-term material
- Short Answer (T/F, multiple choice, matching, fill in blank)
- Problem Solving (similar to homework problems)
- Formula sheet (Boolean logic properties, powers of 2)

### Material Covered

- All lecture notes and handouts
- Textbook: Ch 1, Ch 2, Ch 3, Ch 5, Ch 6, Ch 7, Ch 8 (partial), Ch 9, Ch 10
- Homework: all
- Labs: all (no specifics from lab, only general issues related to lecture topics)

### Topics not covered in Final Exam

- ECE230 review, state machine implementation, any topic covered exclusively in lab (e.g., C programming, PIC controller)

### Students bring to the exam:

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

## Final Exam Objectives

Objectives: At the time of the Final Exam, students should be able to:

### *Prior to Mid-term Exam*

- Achieve all Mid-term Exam objectives (starting with computer history; no 230 review)

### *After Mid-term Exam*

- Identify and describe different types of memory (SRAM, DRAM, ROM, EEPROM)
- Describe memory array structures and interfacing requirements
- Describe microcontroller operating (addressing) modes
- Describe extended memory I/O bus signals and functions
- Design interface to an external memory array
- Explain the structure and operation of the stack (FILO) and stack pointer
- Utilize ASM instructions to control stack operations
- Describe subroutines and explain the difference between a branch loop and a subroutine
- Write ASM code using subroutines and track stack values through subroutine process
- Identify proper subroutine programming practices including parameter passing
- Track values in stack pointer through ASM subroutine calls and PSH/PUL instructions
- Describe exceptions in terms of microcontrollers
- Explain internal and external reset mechanisms in the HC12
- Describe the hardware and software interrupts of the Freescale HC12/S12 controller
- Identify the requirements for interrupt service routines
- Explain interrupt priority and describe priorities for internal/external resets and interrupts
- Calculate count time for timer hardware using prescale factors
- Describe and write functional control code for hardware timer peripheral blocks
- Describe the operation of the free running timer system and the function of timer registers on the HC12
- Write ASM code to create time delays using the HC12 free running timer

- Describe the input capture, output compare, and pulse accumulator functions of the timer hardware
- Construct hardware/software systems integrating timer, interrupt, and memory systems
- Explain basic sampling concepts including sampling rate, resolution, etc.
- Describe the operation of A/D converters
- Calculate A/D digital results from analog values and vice versa
- Describe and contrast different serial communication interfaces
- Describe operation of UART, SPI, and I<sup>2</sup>C communication interfaces
- Describe the shared “open collector” (wired-OR) bus concept
- Create good goals statements meeting SMART Goals criteria.
- Describe an integrated microsystem
- Describe ARM microcontrollers and explain some similarities and differences between the HC12 and ARM microcontrollers

*Underlined objectives are prime candidates for “problem solving” questions*