

EE 371 First (SECOND) Semester Test - Thursday September 27 (OCTOBER 25), 2001
35 Points, 16.667% of Final Grade

Please put your name on the outside of the paper also.
Hand in the test folded so your name shows on the outside.

Name KEY

1. The MC68HC912B32 microcontroller has 32 Kbytes of Flash EEPROM (ROM) in memory space \$8000 - \$FFFF and 1 Kbyte of RAM in memory space \$0800 - \$0BFF. (6 points)

Give a range of addresses (in hex) suitable for locating code: **\$8000 - \$FFFF**

Give a range of addresses (in hex) suitable for allocating variable data storage: **\$0800 - \$0BFF**

Where, and how, should constants (such as messages to be printed) be located in your program?
Constants should be located in ROM, usually directly following the code. The DB or DW pseudooperations should be used.

2. What do the following CASM pseudo-operations or directives do? (4 points)

ORG Changes the assembler's location counter to the value in the expression. Allows code and data to be located in the correct type of memory.

EQU Equate a symbol to a value.

3. Describe the difference between the CASM directives DB and DS. (4 points)

DB defines byte-sized constants for allocation in memory. It both allocates and initializes the memory location.

DS allocates memory storage locations but does not initialize them.

4. Give advantages and disadvantages of each of the following parameter passing methods: (6 points)

a. Using Registers:

ADVANTAGES: Straight forward use of registers; fast; subroutines more generic;

DISADVANTAGES: Not many registers; needs documentation for the user; may lead to control coupling;

b. Using global data:

ADVANTAGES: Can access far more data than when using registers;

DISADVANTAGES: reduced portability of code; potential for module coupling problems to occur;

c. Using the stack

ADVANTAGES: More generic and portable; doesn't use registers; avoids problems of global data; data (stack) area is reuseable

DISADVANTAGES: Need good documentation; easy to mess up the stack pointer;

5. List 5 rules for subroutine or module design when writing HC12 assembly language programs in the lab. (5 points)

Provide single function; describe by active voice; strive for portability and reuse; minimize coupling but good parameter passing techniques; don't mess up registers; treat as a black box; provide documentation; provide subroutine header describing register use; never jmp in or out, always use jsr or bsr and rts;

- d. Write a structured assembly language code segment for the following pseudo code design: Assume P and Q are 8-bit UNSIGNED integer variables in memory locations P and Q. Also assume function X is implemented in a subroutine named X. Insert the code needed for the design in the comments below. You may add more comments if you wish. (10 points)

```
; IF P = $1B
    ldaa P
    cmpa #$1b
    bne endif

; THEN

; WHILE Q < !186
while_begin:
    ldaa Q
    cmpa #!186
    bhs while_end

; DO Function X
    jsr x

; ENDO

    bra while_begin

; ENDWHILEDO
while_end:

; ENDIF
endif:
```