

QUIZ #1

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- 45 Minutes. No materials are allowed. (Number) indicates weighting
- No interaction with another student is allowed during the exam. Cheating will not be tolerated

1. Numbers are stored in the order in which they are printed out in Big Endian. (0.4)

2. There are two ways to represent real numbers in computer. Which one is faster and more accurate? (0.4) floating point.

3. From flip-flops and latches, which one are level sensitive? (0.4) latches

4. What are the functions of the accumulator register in a computer arithmetic/logic unit? (1)
temporary storage location where operations are performed to.

5. How many pins are required for a 16K x 8 RAM with common I/O and one CS input? Consider other pins as well if necessary. (1)

16K = 2¹⁴ → 14 address lines
2 data lines
1 CS line
23 pins total (plus power pins Vcc & VEE)

6. The MCM6209C is a 64K x 4 static RAM chip. How many of these are needed to form a 256K x 16 module? (1)

4 x 4 = 16 chips

7. Determine how many bits each of the following registers can hold? (0.7)

PC, DAR, IR, DR, ACCA, Address Latch/Buffer, Data Buffer
 PC → 4 hex digits = 16⁴ = 2¹⁶ = 16 bits
 DAR → 4 hex digits = 16 bits
 IR → 2 hex digits = 16² = 2⁸ = 8 bits
 DR → 8 bits
 ACCA → 8 bits
 Address L/B = 16 bit
 Data Buffer = 8 bit

8. Assume that initially [PC] = C807, [A] = 09, and [C457] = 08. (0.6)

C807 BB ;ADDA
 C808 C4
 C809 57
A = 09 + 08
 At the completion of this instruction, [PC] = C80A, [A] = 11, and [C457] = 08

9. Examine the following 68HC11 MPU program and answer the following questions: (2)

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R → E230 B6 :LDAA
R → E231 F6 load this address to acc A
R + R → E232 07
R → E233 B0 :SUBA
R → E234 F6
R + R → E235 07
E23D 3E :WAI
    
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- (a) How many times does the address F607 appear on the address bus? 1 + 1 = 2
- (b) How many times does the MPU perform a memory READ operation except WAI instruction? A WRITE operation?
Read → 8 times Write = 0 times
- (c) How many times is a new word loaded into the IR? 1 + 1 = 2 (1 + 1 + 1 = 3 if include WAI)
- (d) How many times is a new word loaded into the DR? 1 + 1 = 2 - 1
- (e) How many times is a new word loaded into ACCA? 1 + 1 = 2
- (f) What are the final contents of ACCA? 0
- (g) Repeat problem (b) including WAI. Read → 9 times Write = 0 times

10. Assume that the following operands are initially stored in data memory: [C350] = 0A, [C351] = 01, [C352] = FF. (2)

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C300 B6 :LDAA      [A] = 0A
C301 C3
C302 50
C303 B0 :SUBA
C304 C3      [A] = 0A - 01 = 09
C305 51
C306 27 :BEQ      [A] = 0 run BEQ
C307 03
C308 B7 :STAA     [A] → [C352] = 09
C309 C3
C30A 52
C30B 3E :WAI
C30C ??
    
```

C308
03
jmp → C30B → WAI

- (a) What will be [A] and [C352] at the completion of the program? [A] = [C352] = 09
- (b) Assume that [C351] = 0A initially and repeat (a). [A] = 0, [C352] = FF

11. A certain program has the op code for a BEQ instruction at address 07A2. What offset should be used to cause branching to 07BC? (0.5)

07A2 BEQ 07A4 offset = 07BC
 07A3 [offset] + offset - 07A4
 07A4 07BC offset = 0018